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FEBRUARY

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

1935

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Somatology and Pathology of Ancient Egypt —*Leigh*
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President of the American College of Dentists

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Original Communications

DENTAL CRIPPLES AND THE HIGH COST OF DENTAL SERVICE: THEIR RELATION TO THE MEDICAL AND DENTAL PROFESSIONS*

By JOHN S. DOHAN, D.D.S., Montreal, Canada

FEW subjects can be of greater fundamental importance to the dental profession as a whole than that of dental cripples and the high cost of dental service. In its various ramifications, it affects every man in this room, every man in attendance at this meeting and, in a broad way, every practitioner in the field of dentistry, no matter what his standing and no matter where his work may be.

The problem of "dental cripples" is one which, to my mind, we must consider very seriously at the present time; anything short of complete frankness in discussion will be of little use. I propose, therefore, to be candid in declaring my views and in stating my diagnosis of the causes of the problem. I shall be equally frank in stating what I conceive to be the remedies.

Let me emphasize, at the outset, that it is not my purpose in any way to discredit or to belittle the work of a great number of conscientious dentists throughout the world who have in the past rendered, and are at present rendering, the best possible service to their patients and who are endeavoring in every way to improve their own personal practice, the standard of which is already high. Such men are entitled to great credit for keeping in touch with leaders in the profession, by attendance at clinics and by reading the best dental literature and in other ways. In addition to constant study, they practice the methods which they acquire through their unremitting labors. If all dentists were motivated by similar high ideals, we should be in a very different position from that in which we find ourselves at present.

Unfortunately, there is also, we must admit, a very formidable part of the profession whose standards are not so high, who do not maintain contact with the leaders and the literature of the profes-

*Read before the Section on Partial Denture Prosthesis at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 8, 1934.

sion and who are content to take the view that they completed their education as dentists when they acquired the diploma which entitles them to practice. The service of such men is of a type which leaves them open to much criticism; but it does infinitely more than that: it is apt to bring the whole profession into disrepute. In reality, these men are "in" the profession but not "of" it in the best sense, and cause endless trouble for their genuinely professional brethren.

My plea, therefore, must be universal in scope. First, I would ask the former group that I have mentioned to take advantage of every possible opportunity to impart their own standards and enthusiasm to the individuals of the other group; and, secondly, I would entreat any of the second group who may hear or read this paper to "fall in line"—for the benefit of themselves, the profession as a whole and the public whom we all serve.

I shall endeavor to point out that (1) a large percentage of the conditions of what may be called "dental cripples" are directly due to shortcomings on the part of the medical and dental professions; (2) much of the dental service rendered is inefficient for various reasons, and is therefore largely responsible for the high cost of dental service, and (3) the remedy lies in the hands of the colleges and the profession at large.

A "dental cripple" will be defined for purposes of this paper as a person who has either had the misfortune to lose one or more teeth, or who retains one or more infected teeth. The extent of the disability naturally increases with the number of teeth which are lost or infected. In all too many cases, this unfortunate circumstance may be charged directly, at least in part, to the inefficiency of those who practice dentistry and medicine, even though it is admitted that, in many instances, there may be a lack of what is often termed "dental consciousness" on the part of the patient until it is too late to prevent the disaster.

I would emphasize, first, the part which the physician must take in connection with responsibility for dental cripples. Thorough mouth examination is clearly one of the most important duties which every physician should be fully trained to undertake. I need not refer at any length to the tongue and what it tells the well-trained physician without uttering a single word. But I must refer to the teeth, which are, in most cases, a living case record of the patient's physiologic history since early childhood.

The need for dental treatment is an S.O.S. call by the life forces of the body, which notify the competent physician that incipient pathologic changes are taking place in the body physiology. On the physician, and on him alone, rests the correction of those deficiencies in the general health which, fundamentally, are the cause of dental disease.

The medical profession should realize its responsibility for a large share of dental disease; for they are the ones who are responsible for the care and feeding of pregnant women and small children. A great many dental troubles are started before birth and in early childhood, when mothers and children are entirely under medical supervision. When they eventually come to the dentist, it is often too late to prevent their becoming dental cripples.

It is the medical men and not the dentist who should be trained in all matters pertaining to nutrition, etc. They should all be qualified to make the necessary diagnosis as to the patient's relative health in individual cases and prescribe the necessary cures. This is entirely a phase of medicine and not dentistry, as it affects the whole body; yet few medical men can

be found who are qualified to make a complete analysis when cases are referred to them by dentists.

It is therefore clearly the function of the medical colleges and the medical journals to place greater emphasis than ever before on the question of physiologic chemistry and the radical changes in metabolism which occur during pregnancy. If the prospective mother is brought by the physician or obstetrician to realize, both for her own general health and that of her child, the necessity for a proper diet, there will be a far better chance of eliminating, at the source, two of the most common causes of the dentally crippled state.

It is now established that there is absolutely no truth in the proverbial saying among our ancestors: "Every child costs the mother a tooth." The chances for the sound health of the children's teeth are also infinitely better than they used to be, given the necessary precautions. In both of these instances, the matter is largely dependent on proper diet. I may therefore dismiss this branch of my subject by repeating emphatically that neglect to give instruction on diet in prenatal and postnatal care is definitely a shortcoming on the part of the medical profession. Indeed, I am confident that the question of nutrition at all ages is properly a matter for physicians and not for dentists, who do not, as a rule, come into the picture until the damage is done and the patient is well on the way to becoming a dental cripple of one kind or another.

Please do not misunderstand these remarks and misinterpret them as an attack on the medical profession. They are intended as a plea for fuller cooperation, that the public may be better served.

I turn to some of the shortcomings of our own profession. It has been computed that, on the North American Continent, a larger percentage of the population receive dental treatment than in other countries (though even here the actual percentage is quite small); yet some of the worst dental cripples are to be found, not, as might be expected, among the vast hordes who do not patronize either dental clinics or private practitioners, but among those who have received more or less regular treatment, either privately or in institutions.

We have seen many clinics which have illustrated countless ingenious mechanical devices demonstrating how lost teeth have been or may be restored, but we do not often read or hear that in civilized countries and communities a large percentage of teeth are lost through what it must be admitted is lack of skill and care on the part of some dentist, thereby bringing about the need for the very same appliances.

I wish to mention some of the various examples of lack of skill or care with which one in general practice is constantly confronted:

Ranking first, we should consider the men—and there appear to be many—who do not remove all the decay from pit, fissure and other cavities in children and adults. This neglect often results in the eventual loss of the tooth and consequent dental crippling. This applies more to those small cavities in that great keystone of dental architecture, the first permanent molar, than anywhere else. The resulting troubles arising therefrom vary from a larger filling to an exposure of the pulp, infection and loss of the tooth, with all of its orthodontic implications, to a long train of complications.

The next in line would be those who will not familiarize themselves with the digital skill and histologic knowledge necessary to recognize and successfully treat cases of what may be called dirty mouths. This naturally includes thorough

prophylaxis and treatment of Vincent's and other periodontal infections. Notwithstanding all that has been written and demonstrated about the necessity for, and the simplicity of, this service, there seems to be a more deplorable lack of ability to cope with the need here than almost anywhere else in the dental field. The number of cases of cripples resulting from this lack of interest and skill is appalling.

The easy route of inserting soluble fillings such as silicious and other cements instead of those of more durable material may be ranked as the next great creator of cases of dental cripples. The indiscriminate use of such filling materials in large cavities, especially in the bicuspids and molars, ruins more teeth than are saved thereby.

Lack of care in the preparation of cavities in which metallic or porcelain fillings are inserted naturally also causes the eventual loss of many teeth which could easily have been saved if proper care had been taken with the original preparation.

Perhaps a more extended reference to the selection of filling materials would seem to be in order at this time. It is very gratifying to see conscientious dentists trying to revive interest in gold foil. Careless operators may make restorations with almost any other material and fool the public, at least for a short time, but with foil, unless reasonable care and a suitable technic are used at the time of insertion, the filling cannot even be completed. Young dentists during the early part of the present century could, on the whole, be rated as good operators, for the reason that much stress was laid on gold foil restorations during their college course. The care which they were obliged to use in this work automatically made them better fitted in other departments. When the silicious cements were popularized by high-pressure salesmen, a broad field was opened up for indifferent operators. Many teeth have been ruined by the injudicious use of these materials.

Just a few words about that excellent tooth preserver, amalgam. Much has been written and many discussions have taken place about the relative merits of this material as compared to other materials, chiefly the gold inlay. Some operators even go so far as to say that amalgam has no place in their practice. Yet one often sees amalgam fillings that have been in place for over fifty years. Surely, a filling material that has so faithfully stood the test of time deserves a high place in the practice of all conscientious dentists.

Inlays of gold and porcelain hold a high place in well regulated practices; but, here again, many such restorations are made, through overenthusiasm, where either foil or amalgam would be a better choice. The oxyphosphate and copper cements, as well as copper amalgam and guttapercha, have a limited use as temporary expedients, but they should never be considered as a means of permanent restoration, although there are some who do appear to consider them as such.

In the replacement of missing teeth, much has been written of the pros and cons for fixed and removable types, and it would be futile to attempt to discuss, let alone to settle, the question in this paper, but, as I have observed on previous occasions, one has only to look around at those attending this meeting, or at any other dental gathering, and note the number of dentists who have large gaps of missing teeth. No doubt, they all have removable appliances of some type or other which are reposing either in their vest pocket or in their bathroom, as are those of their patients.

Needless cutting of teeth in order to satisfy one's mechanical skill in using some fancy attachment or anchorage only

too often results in the ruination of many teeth which would otherwise have lasted a lifetime.

Partial dentures or so-called removable bridges which are constructed of metallic or other substances and which cannot be easily and economically altered to meet changed tissue conditions rapidly lead from a state of partial crippling to a much more serious state.

I will touch lightly on orthodontics as that is one section of dentistry which requires special training and which has not proved a success when incorporated in general practice. Not that this excuses the general practitioner from recognizing and advising treatment of cases when required in order to prevent the inevitable crippling which results sometimes even from simple cases.

A survey of the incomes received by families of the United States and Canada has revealed the fact that the real reason above all others which keeps the vast majority of people away from dentists is that the cost of dental service is too high. The chief cause for the high cost of dental service is not that adequate fees are charged by conscientious dentists for the excellent service which they render to humanity, but that fees are charged for a large amount of dental work which is done without due regard to permanency, by others who are in the profession.

When a dental operation is performed, no matter how simple or how complicated it may be, unless it is done in a manner that will insure satisfaction for at least a reasonable time, it will add to the high cost of dental service and, incidentally, be responsible for the failure of more people to consult dentists, with the further result that more teeth are neglected and we are furnishing more arguments for state or controlled dental service.

As an illustration of the foregoing facts, let us consider a case: A pit or fissure cavity is not properly excavated or filled for a child patient, but a fee is collected. The result is that the filling may fall out, or there may be a continuance of decay. In a short time, the child perhaps returns to the dentist, who, if he is at all honest, will probably make an attempt to repair his fault and may or may not charge a fee. If he does charge a fee, he is certainly increasing the cost of dental service to that patient; if he does not charge a fee, he is depriving himself of income for that time and he will be obliged to recoup himself from some other patient, thereby increasing the cost to the latter. Alternatively, the patient may go to another dentist who, in turn, will charge a fee for his service, thereby making a double charge to the patient for a single restoration.

So it goes, from the smallest dental operation to full mouth reconstruction. Every bit of dental service which is not properly performed and has to be needlessly repeated increases the cost of dental service in some way to the public and this, in turn, above all other things, keeps the public away from dentists and increases the number of dental cripples.

Ample evidence that the public desires efficient dental service can be obtained by visiting any well-conducted free dental clinic. There one will be entirely disillusioned about it being lack of education, fear and indifference that keep people away from dentists. If one cares to go farther and investigate, as Dr. Gies has, one will well realize that the average family budget will not allow for any repeats or refills in dental restorations.

One hears many discussions as to whether there are sufficient dentists to attend to the needs or demands for dental service. All agree that the number is not nearly sufficient to meet the real needs, but is ample, in most cases, to meet the demand. If the need is there and the

demand lacking, in an overwhelming majority of cases, when investigated, we find the explanation to be that it costs too much to go to a dentist.

Overspecialization has been a common cause of adding to the cost of dental service. You may remember that I have already gone on record as an advocate of the view that in the past dentists have gone to extremes in the matter of specialization.[1] Possibly, the depression has been a sound corrective of this extravagance. It is my view that every dentist should be so thoroughly trained that he can, in the vast majority of cases, undertake the responsibility of caring for his patients himself, instead of sending them to one specialist for one thing and to another for a second. In recent days, people simply have not had the money for such a procedure, and this has, on the whole, been good for specialists, who have had to become general practitioners again. Looked at from the standpoint of "the greatest good of the greatest number," this can be said to have been for the public good. Of course, we must have specialists, but it is of far greater importance that the general body of dentists be capable of attending to the needs of the members of the average family who come in for service.

Another reason for the high cost of dental service is the number of young dentists who establish themselves in expensive office buildings in business and shopping districts, instead of in residential or rural localities where rentals and other expenses are much lower.

The amount of useless "specialized" equipment which is manufactured and sold to dentists by high-pressure salesmen is also a cause of the high cost of dental service.

All of these facts, and many more which could be mentioned, are only too evident to anyone who cares to spend a little time in investigating.

Let us turn to consider the relation of the schools to our main problem: Unfortunately, many dental schools are operated at a deficit, and, in some cases at least, the deficit can be reduced or wiped out if the classes are of sufficient size. I need hardly remind you that mere size is no criterion of excellence—indeed, the situation really works the other way. I would even go so far as to state that this "worship of numbers" is a most unhealthy influence in some schools. Students have been admitted to study, and finally allowed to graduate as dentists, whose qualifications to practice on the public, if the truth were confessed, could easily be questioned. The enforcement of what is called the two-four plan, or in other words, six years after high school, only seems to have aggravated this condition, as the extra years of college work keep away a great many skilful young men and women on account of the high cost of dental education, and there is a consequent tendency to encourage the sons and daughters of those who are called well-to-do. It is an acknowledged fact that students who are recruited from those families do not always make the best practical dentists.

The resultant falling off of efficient dental graduates has served only to increase the number of dental cripples, and it has brought the day of state or "panel" or other forms of controlled dentistry appreciably nearer. This, in my opinion, would be very much to the detriment of the public and the profession.

A few years ago, a survey committee was appointed by the American Association of Dental Schools to study, and try to put forward, a more definite plan for teaching. Much good work has been done by this committee and, no doubt, a great

1. Proc. 7th Ann. Meeting, Am. A. D. Schools, Toronto, 1930, p. 273.

deal of good will accrue from the fruit of their labors. At the present time, their suggested curriculum seems to be so elaborate that it will defeat the very purpose which it was hoped to accomplish. Many new subjects and lectures of questionable merit are suggested; which will necessitate an increased number of lecturers and lecture hours and, in consequence, increase the cost of dental education and, indirectly, dentistry. It will also tend to take very valuable hours away from clinical training in the third and fourth years, when a maximum effort should be put forth to train the eye and hands in operative procedure. A few who are enthusiastic over this suggested curriculum say that it will place dentists more on a par with medical men. Why should the dental profession strive for such a status? It is a well-known fact that the medical profession at large are very indifferent to dental problems; and, surely, we do not desire to educate dentists to the same state of indifference.

The advisability of duplicating in dentistry teachings which rightly belong to the medical profession, at the cost of teaching students less operative dentistry, seems to be a very serious mistake, as the crying need of the public today is for dentists who can do better operative work.

Also, operative dentistry is the real backbone of dentistry—it is the bread and butter of dentists; yet the operative section on a program such as we have at this meeting invariably draws the smallest attendance, while the full denture and oral surgery sections usually draw the largest crowds. This would seem to indicate that many dentists are more interested in the spectacular things from which they can draw large fees with a minimum of effort than in the small preventive and restorative parts of their service as professional men.

The apparent reason for lack of interest in the advancement of the operative end of dentistry is that it entails really hard work. It would appear that there are many who, when examining a case, have only one thought in mind, and that is the financial return. In other words, they look to see what part of the mouth they can take an impression of in a few minutes—most often a very poor impression—and send this either to a private or to a commercial laboratory, hoping to get something back in a few days for which a large fee can be collected.

Governments, private corporations and philanthropists are realizing that if we are to have a healthy race of people, we must have people with healthy mouths, and if we are to have healthy mouths, we must have a sufficient number of well-qualified dentists to look after the teeth, first, of the mothers and children and, secondly, of all adults. When this is properly done, they justly feel that there will be little need for the full denture and many other specialties in dentistry.

If we, as a profession, do not do our part in raising this operative standard of dental graduates, others will be sure to take the whole matter of dental education out of our hands. At present, the dentists of this country control the admission to practice dentistry through their various boards. If a closer check is kept by those boards on the type of graduates who are released every year by the various colleges, and if those who are not thoroughly competent are refused the right to practice, some colleges will realize that if they are to continue to teach dentistry, they will be obliged to use other means, not only of teaching, but also of selecting students. In other words, only those who show an aptitude for practical application should be instructed, even at the expense of academic

qualifications, for the present at least. It is my firm belief that if only students who were adept in operative skill were allowed to continue their studies, the standard of dentistry would be raised infinitely more than by insisting on a high academic training without due regard to other qualifications.

May I, then, sum up my major conclusions with reference to the most urgent needs of the present state of affairs in respect of dental cripples, if the situation is to become better, as we all hope, and not worse, as there is grave reason to fear that it may.

1. There must be better cooperation than ever before between the medical and the dental professions. This would probably be achieved to the greatest advantage of all concerned by assigning definitely to the medical profession certain subjects, especially nutrition and the prenatal and postnatal care of mothers and infants, about which there has hitherto been no agreement as to the proper field in which they should be placed. Such action would permit the dental profession to concentrate its efforts on subjects which are definitely dental in all respects.

2. We as dentists must realize that (*a*) we are doing work which affects the lives of our patients, and we should therefore keep ourselves mentally and physically equipped, in order to render the most efficient health service; (*b*) we should place our patients' health interests before our own interest in fees; (*c*) we should strive to become family dentists, capable of looking after most of the needs of those who come in for treatment, without too much recourse to specialists. We should, of course, be broad enough to seek the advice and assistance of others in all matters of which we are not ourselves masters, and (*d*) we should strive to improve our practical procedure in all departments, in order that the cost of dentistry to the public may be reduced, and we will thereby be able to render better service to a greater number.

3. The dental schools should cooperate by giving a very definite lead. This can be done, positively, by elevating the operative standards and by paying greater attention to the personnel of students permitted to enter the profession; and, negatively, by refusing absolutely to issue certificates to those who are not thoroughly competent in the field of practical dentistry. The schools must be guided by the principle that it is better operative dentists rather than more mediocre dentists that are needed.

Finally, the education of the public, as well as of the students, must be the constant aim of our schools and associations. Collectively, we can bring a persuasive pressure to bear on the medical profession and on health authorities in general, with a view to making the public more interested in dentistry. When that state of affairs arrives, dentists as a whole will be more fully performing their duties and services to their fellow-beings than they are today, and we do not need the regimentation of "state dentistry" to bring it about.

The professions were conceived in idealism, and there are thousands of dentists throughout the world who have held high the torch of service. It is my ardent hope that history will find us all worthy of the best standards of our time.

NOTES ON THE SOMATOLOGY AND PATHOLOGY OF ANCIENT EGYPT*

By R. WOOD LEIGH, A.B., D.D.S., M.A., F.A.C.D., Fort Omaha, Nebr.

THIS study is based on the examination of the Egyptian skeletal collection in the Museum of Anthropology, University of California. G. A. Reisner's monograph[1] is the archaeologic background as to provenience and chronology. The collection is the largest and probably the most representative, geographically and chronologically, of all in America. The material is fragile, owing to its extreme age—some of it being, roundly, 6,000 years old and to the exigencies of shipping from Cairo to Berkeley. All cranial specimens, including calvarium, facial bones and teeth, were examined and notes made on them. Details of descriptive characters and measurements were carded for 230. The craniometric measurements were made in accordance with the definitions and technics outlined in Hrdlička's "Anthropometry." The instruments and aid used were: *compass d'épaisseur, compass glissière,* metric rule, copper wire and hand lens.

SOMATOLOGY

Only certain facial measurements and an attempt at appreciation of some nonmeasureable features of maxillae and dentition were made on this group. The stature was slight, the height probably about 66 inches average; the figure agile and pleasing. Skulls from predynastic burials are extremely narrow at the temples, diverging toward the parietal bosses, rather long, but characteristically pentagonoid or "coffin-shaped" when viewed from the vertex. When better filled, the outline is ovoid. There is a prominent rounded eminence of the occiput between the crest and lambdoid suture. The forehead tends to be vertical and fairly high. There are rather high, distinct temporal crests, which indicate a fairly well developed masticatory musculature. The zygoma is peculiarly flat laterally and thus harmonizes with the lateral aspect of the calvarium. The bridge of the nose is high, smooth and well-formed. The face is orthognathous (see gnathic index). The whole cranium is refined in structure. The palate is usually ovoid or elliptical, and thus simulates in outline the vertex. It is uniformly symmetrical and pleasing in outline, and malposition of teeth is extremely rare.

Mandible.—With regard to racial variation, G. Elliot Smith[2] has this to say of the mandible: "It is a part of the skeleton which lends itself most admirably to the display of those racial con-

*Originally published with full tables in Univ. California Publ. Am. Arch. & Ethnol., 34:1-54, 1934.

*Read at the Seventy-Fifth Annual Session of the American Dental Association in conjunction with the Chicago Centennial Dental Congress, Aug. 10, 1933.

1. Reisner, G. A.: Early Dynastic Cemeteries of Naga-ed-Der, Univ. Calif. Publications, Egyptian Archaeology, Vol. 2, Leipzig, 1908.

2. Smith, G. E.: Ancient Egyptians, London, 1923.

trasts, such as are associated with other differences of skull and skeleton."

Greenwell and Rolleston insisted on the exceptional importance of the mandible as a racial document. Great muscular development will alter the size and the ruggedness of the bone, but cannot affect those essential features of its form which reveal racial traits. Nor, again, is the shape of the bone determined wholly by the form of the cranium, as some anatomists maintain.

In races in which there are well-defined sexual differences, the mandible may serve as an important aid in sex determination. The female mandible is usually smaller, more delicate in outline and surface character and smoother, and the areas of insertion of the musculature are not so rough as in the male. As a rule, the angle is more obtuse in the female; but the sexual characters of the Egyptian skull are ill-defined as a rule, and sex determination from the whole skull is often attended with considerable uncertainty. Indices derived from the craniometric measurements would seem to indicate a correct trend in my sex determination by cranial characters, including the mandible.

Two distinct mandible types appear in Egypt. The archaic type is rather small. Relative to the body, the ramus is short and broad, the angle is definite and the anterior border of the ramus is an open s with the concavity beyond the third molar and a considerable convexity below the coronoid process. The sigmoid notch is a wide graceful crescent, the impressions of the insertions of the muscles are prominent, the gonions may be slightly everted and the chin is pointed.

Another type, apparently more recent and possibly of an intrusive stock, is characterized by a high, narrow ramus, surmounted by a high, pointed coronoid process, a fairly deep sigmoid notch, a fairly straight anterior border of the ramus, an angle singularly obtuse and indefinite, large mental foramina and smooth rounded menton. This type mandible is effeminate. There is, of course, a range of variation in both the archaic and more recent types.

Table 1.—Range of Mandibular Measurements

Measurement	Average		Minimum		Maximum		Mandibles	
	M	F	M	F	M	F	M	F
Bicondylar	115	109.2	105	100	124	115	(32)	(30)
Bigonial	95.3	89.8	87	81	103	101	(44)	(32)
Symphysis	34.6	30.9	30	27	44	36	(50)	(39)
Body	30.3	28.6	26	26	37	32	(52)	(27)
Ramus, minimum	33	30.8	28	26	38	36	(52)	(44)
Sigmoid notch, height	51	45.8	38	40	58	56	(48)	(40)

Table 1 gives the range of mandibular measurements, male and female separately—a summary. There is no appreciable difference between the two sides of the mandible; i.e., with but few exceptions, it is symmetrical. The slight but consistent difference between the sexes as shown in the table would seem to indicate that my sex determination tended to be correct, as the range for females is smaller than for males. This contrast also holds for the maxillary measurements, but to a slighter degree.

The two pairs of genial tubercles on more than half of the Egyptian mandibles are low, rounded or ill-defined. Even on males, who ordinarily have

larger and sharper tubercles than females, they are poorly developed. The tubercles are in keeping with the small, refined mandible of the Egyptian.

The mental foramen for the terminal branches of the inferior dental nerve and artery is located rather below the middle of the mandible and anteroposteriorly anywhere from the apex of the first bicuspid to below the mesial root of the first molar, the mode being the position below the second bicuspid. There were instances of accessory foramina and of asymmetry.

Palate.—Palate form is an important racial feature. There is a conformation, an architecture, peculiar to distinct races. Length and breadth measurements of the palate, while of some value, do not adequately convey a realistic concept of its particular form; and, of course, leave off any idea of curvature or height. Photographs or projection drawings from the palate itself convey a truer idea of the type form. Fifty per cent of the Egyptian skulls have a roughly elliptic palate. In 25 per cent, the lateral lines diverge (parabolic). Nearly 25 per cent have rather parallel sides (u-shaped). A very few are rotund. A medium height predominates, with gradations toward either shallow or high.

Table 2, a résumé of maxillary measurements, gives the range of palate length, from prosthion to alveolon, and alveolar breadth, the maximum spread outside the alveolar process. The ratio of breadth to length is the maxillo-alveolar index; also given for males and females separately. This maximum breadth spread is from 100 to 127 per cent of the palate length. The average for males is 115.5, for females, 118.1. Analysis of data for the maxillo-alveolar and other indices to determine homogeneity or heterogeneity of a group is made by first arranging the measurements in seriation. Each index will show an extended range of variation; and there will appear some aberrations, discontinuous numbers, in the range. If the original data card for such an aberrant number is consulted, the cause for its oddity will often be apparent; i.e., senility or subadult, edentulous, pathologic deformity; or there may be some racial intrusion. Then the range of numbers is subdivided or given a classification; and the percentage of occurrences falling in each class is determined. The degree of similarity of the individuals will now be apparent.

Table 3, the classification of indices, subdivides the range of the maxillo-alveolar index as follows: dolichouranic, 109.9 and under; mesuranic, 110 to 114.9; brachyuranic, 115 and over. The percentage of palates in each class, and

TABLE 2.—RÉSUMÉ OF MAXILLARY MEASUREMENTS

Measurement	Average		Minimum		Maximum		Skulls	
	M	F	M	F	M	F	M	F
Prosthion-alveolon	54.6	51.4	48	45	62	59	(72)	(76)
Alveolar breadth	63	59	56	50	70	67	(73)	(76)
Maxillo-alveolar index	115.5	118.1	100	103.3	127	127	(73)	(74)
Basion-prosthion	93.4	92	88	85	104	106	(69)	(71)
Basion-nasion	101	96	91	91	109	104	(69)	(71)
Gnathic index	95.2	95.6	85.1	85.2	103	104.9	(69)	(71)
Dental length	41.4	39.8	38	35	47	44	(53)	(38)
Dental index	40.9	41.4	35.7	36.3	48.4	47.2	(53)	(38)

for the sexes separately, is given. It is to be noted that more than 50 per cent are in the broad palate class.

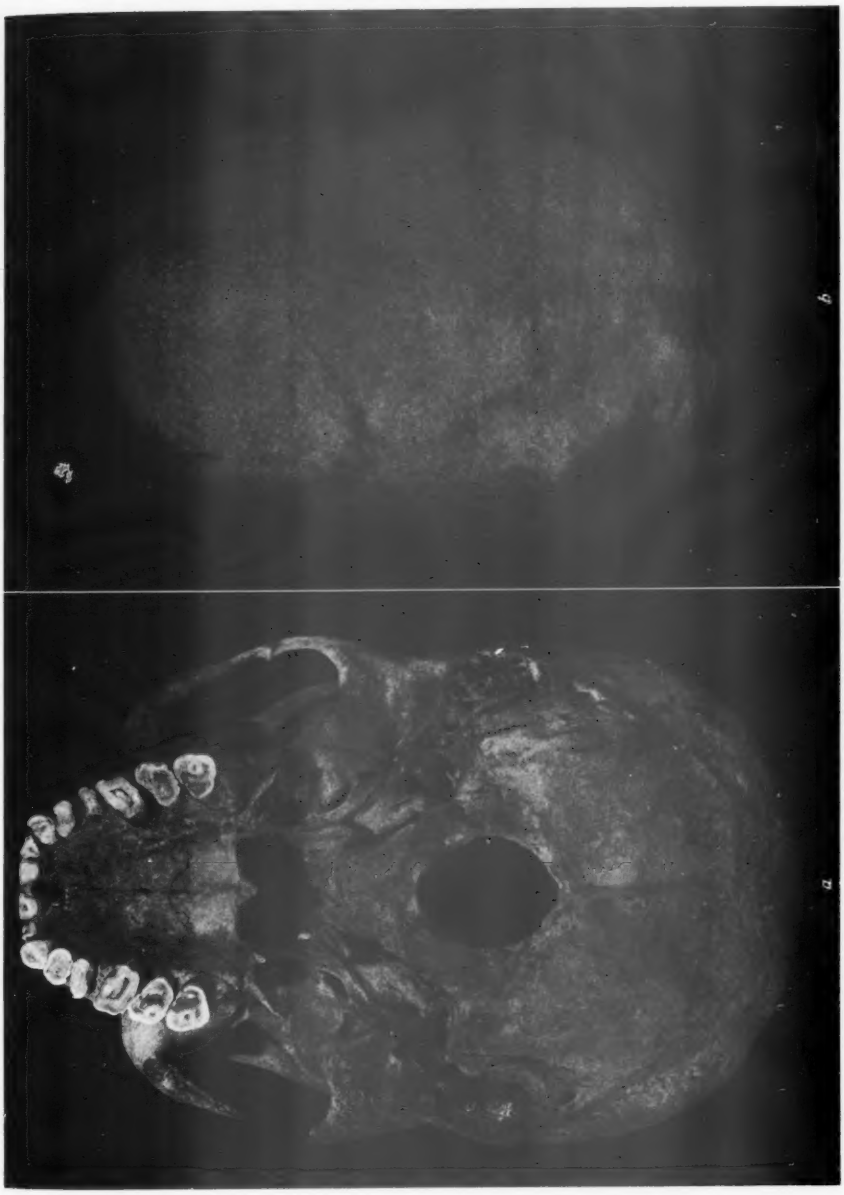
Dental Index.—The dental length is the distance from the mesial surface of the maxillary first bicuspid to the distal aspect of the third molar, with all postcuspid teeth *in situ*. The ratio of this length to the basion-nasion length is the dental index. The range of this index is divided into microdont up to 41.9; mesodont, 42 to 44, and megadont, above 44. Table 3 gives the percentage of skulls of this group in each class. About 66 per cent are microdont, possessing small teeth.

Gnathic Index.—The gnathic index of Flower is an important cranial criterion for determining racial relationships. This index is the ratio of the basion-prosthion length to the basion-nasion length; the greater the ratio, per cent or index, the greater the projection of the jaw, and consequently the more apelike the countenance. In short, it is an indication of facial prognathism. The range of this index is divided as follows: orthognathous, below 98; mesognathous, from 98.1 to 103; prognathous, above 103. It so happens that the Ancient Egyptians have a low gnathic index, my average for males (sixty-nine) being 95.2, and for females (seventy-one), 95.6. Reference to Table 3 will show that approximately 75 per cent are in the orthognathous class; and only three skulls have a prognathous index, one of which was so aberrant that I concluded that it was intrusive, doubtless negroid. The range is from 85.1 to 104.9 in the entire group. The table indicates a general correlation between the orthognathous and microdont, mesognathous and mesodont. In short, the straighter the face, the smaller the teeth are apt to be.

TABLE 3.—CLASSIFICATION OF INDICES

	Males		Females	
Maxillo-Alveolar Index	No.	Per cent	No.	Per cent
Dolichouranic	14	19.1	16	21.6
Mesuranic	17	23.3	17	23
Brachyuranic	42	57.6	41	55.4
	73	100	74	100
Dental Index				
Microdont	35	66	25	65.8
Mesodont	13	24.5	8	21
Megadont	5	9.5	5	13.2
	53	100	38	100
Gnathic Index				
Orthognathous	50	72.5	57	80.3
Mesognathous	19	27.5	12	16.9
Prognathous	(1)		2	2.8
	69	100	71	100

Occlusion.—Even though the Egyptian is orthognathous, the shortened maxillae amply provide for a symmetrical dental arch with its units in beautiful alinement. The compensatory changes accompanying shortened maxillae have been reduction in tooth size, and, to some extent, degradation of form of the two posterior molars particularly (see dental index, cusps). There is seldom incongruity of jaw size and tooth size



Left: Fig. 1 (No. 4834, male).—Fourth degree attrition, exposing pulps.
Right: Fig. 2 (No. 4809, female).—Pentagonoid vertex; ethnic parietal lesions.

resulting in some of the teeth being crowded outside the line of occlusion. Only one exception is present: a female, aged 25, with a u-shaped, undersized palate, has the two cuspids in facioclusion and the right third molar in distobuccoclusion.

The mesiodistal relationship of mandible to maxillae is invariably correct. From function and attrition, in older persons the incisors may assume an edge-to-edge relationship. In the group, only five other simple Class 1 (Angle) cases of malocclusion occur.

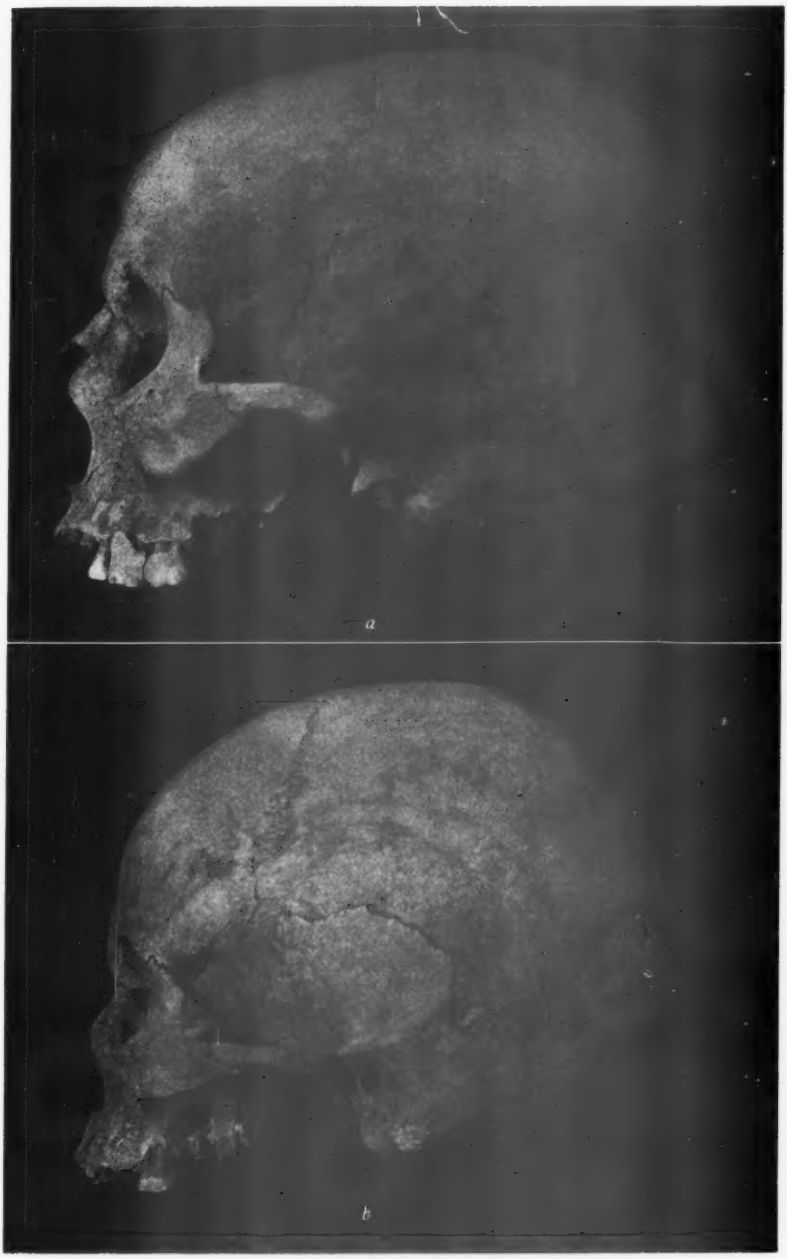
Diastema.—Skull 5066, male, predynastic, has a diastema measuring 5 mm. at the cervix between the lower cuspid and first bicuspid bilaterally. The upper teeth are large. This is a simian character, which accommodates the interdigitation of the larger upper cuspid. In only this instance was this anomaly of phylogenic significance noted.

Tuber Maxillare.—The maxillary tuberosity has interest from morphologic as well as surgical and prosthetic considerations. I measured the postdental length of the alveolar process in 140 skulls. This length varied from 1 to 10 mm., and 128 were equally distributed in the range of lengths from 2 to 5 mm. More females than males had the shorter measurement. On the evolutionary hypothesis that the progressive shortening of the maxillae and mandible accompanying the frontal enlargement of the braincase has resulted in a mutability in size and form of the teeth, a correlative form of tuber maxillare and third molar might be anticipated; i.e., a tooth may be small because of lack of space in the shortened jaw. There seems to be no true correlation in this regard in this group. No. 4782 has small third molars with two and three cusps, but with a postdental alveolar space of 6 mm. No. 5132 has very diminutive third molars—abortive vestiges—yet posterior to these teeth is an alveolar extension of 10 mm. It appears that the size and form of the third molar is not always dependent on the length of the tuberosity; nor the tuberosity on the size of the tooth. Jaw form and size, and tooth form and size, would appear to be distinctly separate units of inheritance.

In the mandible of living orthognathous races, such as Caucasian and Japanese, incongruity of jaw length and tooth size is often unfortunate for the individual, resulting in the presence of oversized, impacted or malposed teeth. In the Egyptian group, there were not more than two malposed mandibular third molars. Impacted maxillary cuspids occur with different causative conditions operating.

Tooth Morphology.—The enamel is well formed and usually has a white to light brown hue. In an appreciable number of persons, it is singularly smooth with a beautiful pearly or waxy luster and light cream to whitish hue. These teeth probably received systematic hygienic attention. Crenated or convoluted enamel is observed occasionally and only on third molars. No. 5155 has maxillary molars in which there is a deep circular groove demarcating the occlusal third. This doubtless is of dystrophic origin—a hypoplastic defect. The cusp elements are demarcated by deep grooves more frequently than not; but this does not imply a break in continuity of enamel. In the absence of requisite oral environmental factors, these deep grooves are not the locus of caries. Occasionally, a detached enamel pearl is present on a root some distance from the cervix.

Cusps.—The cusp formula of the molar teeth varies with race. The dentition of archaic races, such as the Australian, and negroid stocks, is comparatively constant in cusp pattern; while



Above: Fig. 3 (No. 4894, male, Copt).—Dental accretions; afunction.
Below: Fig. 4 (No. 4886, female).—Osteitis of maxilla, involving sinus.

most other races evidence considerable mutability of cusp formula. In archaic races, the maxillary molars are quadricuspid, the mandibular quinquecuspid:

$$\frac{4\text{-}4\text{-}4}{5\text{-}5\text{-}5}$$

The cusp form of the mandibular second molar has received special somatologic study. In modern Caucasians, this molar usually has but four cusps. Owing to advanced attrition and antemortem loss, observation of this tooth was limited to eighty-one mandibles. These jaws came from all sites and eras. The cusp form of the mandibular second molar appears to have been stable for 4,000 years in Egypt, and it is strictly comparable to that of other white races, including the typical crucial arrangement of the grooves.

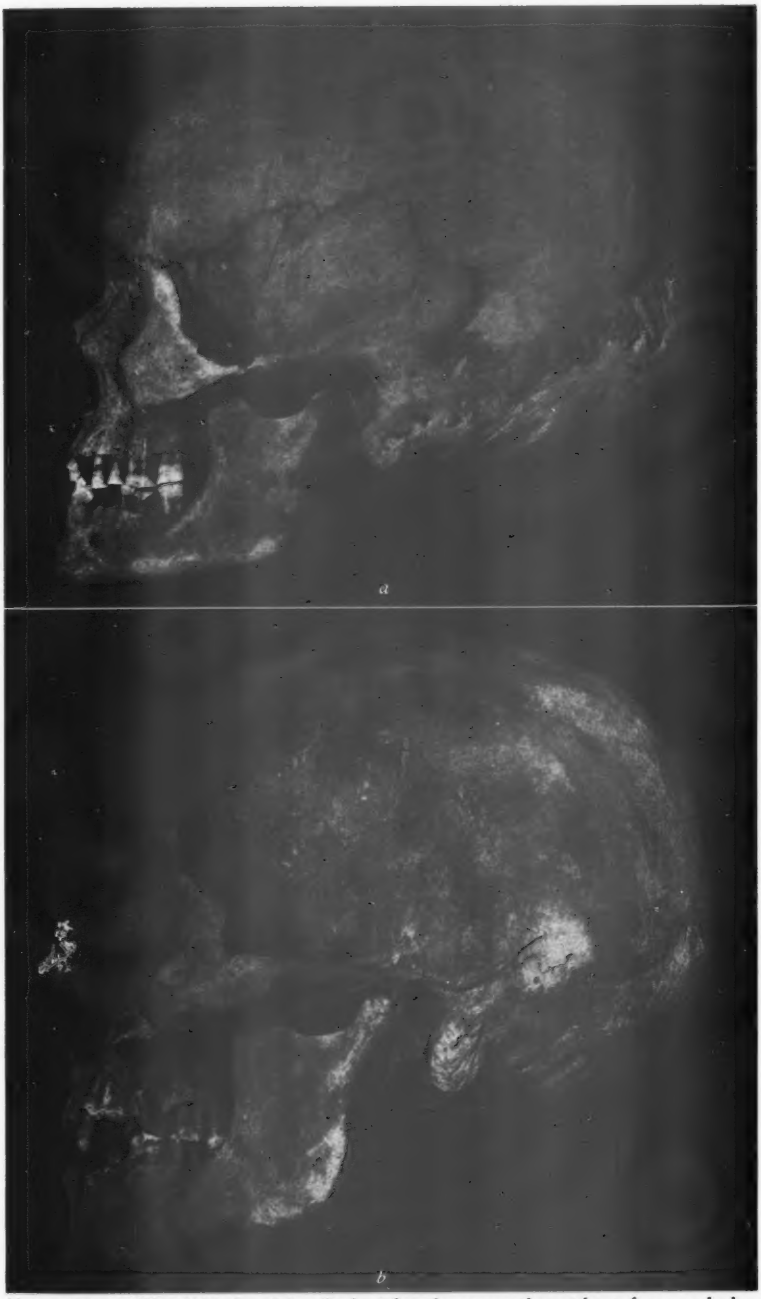
The norm of the mandibular first molar in this group is five cusps, the fifth cusp being a small triangular tubercle intercalated at the middistal margin. That of the second is four cusps. There is distinct contrast in size and form between these two teeth, typical of modern Caucasians. The inferior third molar tends to be quadricuspid; but it is frequently degenerate, small or diminutive. It maintains its size and form better than does the maxillary third molar.

The Egyptian maxillary first molar is distinctive. In addition to the normal four cusps, it has an accessory cusp which is known as the *tuberculus anomalus* of Carabelli. This accessory element is coalesced on the lingual aspect of the mesiolingual cusp. Where a sizeable cusp is not present, there is a vestige, an incipient bulge demarcated by a slight groove or pit. There is also a tendency to form these cusps on the second molar, concrete evidence of evolutionary changes. It can be definitely stated that the dentition of the remains of the Gizeh Pyramid-builders, like those of Proto-Egyptians from Naga-ed-Der, is characterized by constancy of Carabelli's cusp on the maxillary first molar, a racial character. It is asserted by Duckworth[3] that this accessory cusp is distinctive of the higher rather than the lower human races.

The maxillary second molar is undergoing degradation in this Egyptian group second only to that of the third, both in form and size. Both the second and third maxillary molars appear to be compressed in the arch mesiodistally, and assume a characteristic trapezoidal form. The decrease in size and distortion in form are largely at the expense of the hypocone, distolingual cusps.

The maxillary third molar evidences many gradations of involution from a quadricuspid to a tricuspid, bicuspid and conic form. The predominating tendency is to the tricuspid form, trapezoidal or triangular in outline. No. 5159 has a left tricuspid third molar on which are two indistinct lines evidencing the degradation of the hypocone, distolingual cusp. On the right is a tiny crescentic tubercle. This is concrete graduated evidence of involution. No. 4959 has a third molar with the distolingual cusp placed linguad from the mesiolingual cusp, as though the tooth had been compressed mesiodistally. Some maxillary third molars have a small extra buccal element fused to them. This buccal cusp is the homolog of an infrequent supernumerary element in this region in some races, an atavism of a larger dental series. Diminutive size of maxillary third molars is not necessarily imposed by lack of space in the alveolar arch. No. 5132 has diminutive, cylindrical third molars which measure only 5 mm. in diameter; but there is posteriorly an excess space of 10 mm. in the tuber maxillare.

3. Duckworth, W. L. H.: Morphology and Anthropology, Cambridge, 1915.



Above: Fig. 5 (No. 5122, female).—Occiputal eminence; orthognathous face; arched nasal bridge. Below: Fig. 6 (No. 4803, male).—Periapical osteitis; osteo-arthritis of temporomandibular articulation.

The molar norm for the California Egyptian group tends to be, in the maxilla, a rapid diminution in size from first to third. The first molar possesses Carabelli's accessory cusp; the second is markedly compressed mesiodistally; which produces a trapezium in occlusal outline, largely at the expense of the hypocone, both in size and form. The other cusps are reduced and distorted also. The third maxillary molar is tricuspid, with some vestigial markings of the hypocone. No skulls were devoid of evidence of the third molar; nor is its reduction so great as obtains in an appreciable number of skulls of another race I recently examined, pre-Spanish Peruvians, in which it is a vestigial remnant. In the mandible, the first molar is quinquecuspid; the second is quadricuspid, and the third tends to be quadricuspid, there being some variants. If the *tuberculus anomalus* is assigned the value of one-half cusp, the dental cusp formula for Egypt is:

$$\frac{4.5\text{-}4\text{-}3}{5\ \text{-}4\text{-}4}$$

Roots.—Crown form and cusp evolution have received much more detailed study by anatomists than have dental root forms. The following are some of the anomalies observed in the Egyptians. The mandibular bicuspids are characterized by a bifurcation line throughout their length; and the first is more often than not bifid in its apical third, with distinct divergence of the two moieties. A form very similar to this was found to be the norm in the dentition of several tribes of American Indians. There were occurrences of bifid inferior cuspid roots.

Nos. 5222 and 5250, males, have upper bicuspids with three completely divergent roots, and the former has the lower second bicuspid root marked with a deep bifurcation line. With respect to bicuspid roots, Duckworth[3] observes: "In the Simiidae, the upper premolar teeth have three roots, thus resembling the upper molar teeth in those animals and in the Hominidae. The occurrence of three-rooted upper premolar teeth in the Hominidae is by no means unknown." I have observed the occurrence of three-rooted maxillary bicuspid teeth in the Eskimo, Sioux, California Indians, Peruvians, prehistoric people of Guam and old Hawaiians. In modern white races, this form of bicuspid is of infrequent occurrence.

PATHOLOGY

Attrition.—Attrition is the gradual wearing away of the hard parts of the teeth through the physical and physiologic agencies of mastication of food. Dental disease of the archaic Egyptians is characterized by attrition, to the degree of pulp exposure, particularly of the maxillary molar teeth; and resultant periapical osseous lesions. It is possible that these lesions were causally related (primary infection foci) to the serious and wide-spread osteoarthritic deformities of the Nile people. Attrition frequently shortened the teeth to their cervices without pulp exposure (No. 5046). This is particularly true of the maxillary bicuspids. The gradual centripetal lesion stimulates the pulp to form adventitious dentin, which is laid down in apposition to the shortening process. In these teeth, the pulp retreats and successfully blocks, literally and figuratively, the onslaught of attrition, which threatens its exposure. Microscopically, the secondary dentin is dense with few, if any, fine fibrils. Macroscopically, it is well-defined. The circumferential primary dentin has become sclerosed by reduction and obliteration of the dentinal tubuli. The destructive and irritating action of attrition stimulates the pulp and protoplasmic fibrils of its peripheral cells to react in a protective

manner by retreating, diminishing in size and increasing the density of its protective covering.

But the protective reaction of the vital dental tissue frequently fails to cope with the rapid centripetal destruction of the maxillary first molar in particular, caused by functioning on an abrasive diet. The eruption of this tooth in the sixth year, together with its key position in the arch, which tends to impose the brunt of the masticatory function on it, make for its destruction before others. In predynastic times especially, the trituration of bread containing the coarse husks of barley and millet, or resistant stringy

Fig. 7 (No. 4803).—Hyperplastic bone in left glenoid fossa; osteo-arthritis. (From specimen shown in Figure 4.)

fibers of marsh tubers, admixed with a liberal contamination of rock particles from the grinding stones and the desert winds, abraded the functioning surfaces of the teeth too fast for vital protective reaction to save the formative organ, the pulp.

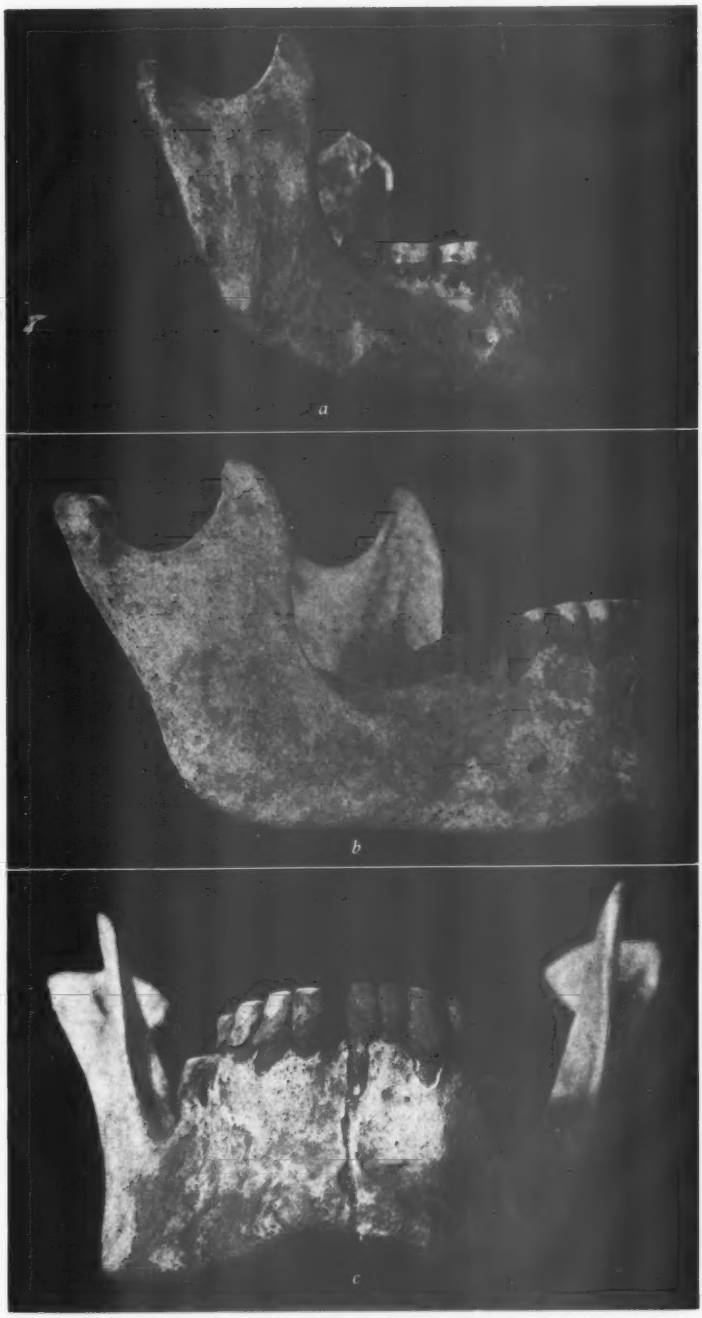
Even royalty of the seventeenth dynasty exhibits the effects of an abrasive diet. Smith, in his publication, "The Royal Mummies"[4] depicts the mummy of the king Saqnounri III, and remarks: "Although the teeth are so well-worn as to be almost all molariform, the fact that all the cranial sutures are still patent suggests that the king was not much more than thirty years of age at time of death." In describing the type jaw he further says: "There is a complete set of healthy teeth almost entirely free from tartar deposits. The third molars on both sides of both jaws are practically unworn, but all the other teeth are well worn."

Attrition of teeth is common in the remains from all the sites, ranging from exposure of dentin of the cusps, first degree; through second, obliteration of cusps leaving islands of enamel at the bottom of grooves, and shortening of the crown to near its neck, third degree, to exposure of the pulp, fourth degree, and beyond. Remains from the earlier epochs evidence wear earlier in life, and more teeth with fourth degree attrition than those of the Middle Empire; while Coptic specimens have slight wear, in fact showing afunctional conditions of the teeth. Not only was attrition the primary cause of pernicious periapical osseous lesions and possibly metastatic consequences (see periapical osteitis, osteoarthritis), but also a proximate factor in the causation of dental caries by means of inducing interproximal food impaction following obliteration of contact between the units of the arch. Generally speaking, cusps were obliterated by 35 and one to four first molars had the pulps exposed by 50. In many old persons, the pulp of every tooth was exposed through wear. No. 5244 is an example.

Dental Caries.—In this collection, only 12 per cent had one or more carious teeth. One was a child of 7, there were seven young adults, and twenty were from 40 to senility, at decease. Thus, caries in Egypt had its highest incidence of occurrence passed middle life. Occurrence was practically the same in each sex. Of an aggregate of fifty-four cavities, 60 per cent had their initiation at the proximocervix. The lesions developed at these proximocervical sites after the teeth had been worn beyond the contact points, or after slight migration of teeth in the arch following the loss of some; both of which conditions induced food impaction and eventuated in caries. There are few pit cavities. Only postcuspid teeth were attacked by caries. About 65 per cent of persons having carious teeth had periapical osseous lesions consequent thereon —on an average, two each. Widespread attrition and negative evidence of caries in predynastic times seems to indicate that their coarse diet was not conducive to caries. Also, it seems to appear that caries was more prevalent in upper social strata in later epochs, people living on a more refined diet, as suggested by the greater number from Gizeh, remains from the mastabas of the pyramid builders.

Periapical Osteitis.—Exposure of the dental pulp by any destructive process entails its infection and ultimately necrosis, since this bit of embryonic tissue encased within unyielding walls is utterly devoid of powers of regeneration. Infection atria are simultaneously opened via the apical foramina into the periapical

4. Smith, G. E.: Catalogue du Musée du Caire, Royal Mummies, Cairo, 1912.



Above: Fig. 8 (No. 5189, female).—Type mandible: high narrow ramus; obtuse angle. Center: Fig. 9 (No. 5160, male).—Pendulous calcareous accretions. Below: Fig. 10 (No. 5160). —Alveolar resorption below accretions. (Specimen shown in Figure 9.)

tissue. The infected alveolodental periosteum proliferates and the surrounding bone is involved in a limited osteitis with or without a fistulous drainage into the oral cavity. The initial acute stage is followed by a usually painless continuous lesion as long as the tooth remains *in situ* and until the proliferating membrane is destroyed. In skeletal material, this chronic process is evidenced by apertures of varying size in the alveolar processes into which project denuded root apices, as is richly illustrated in the Egyptian collection.

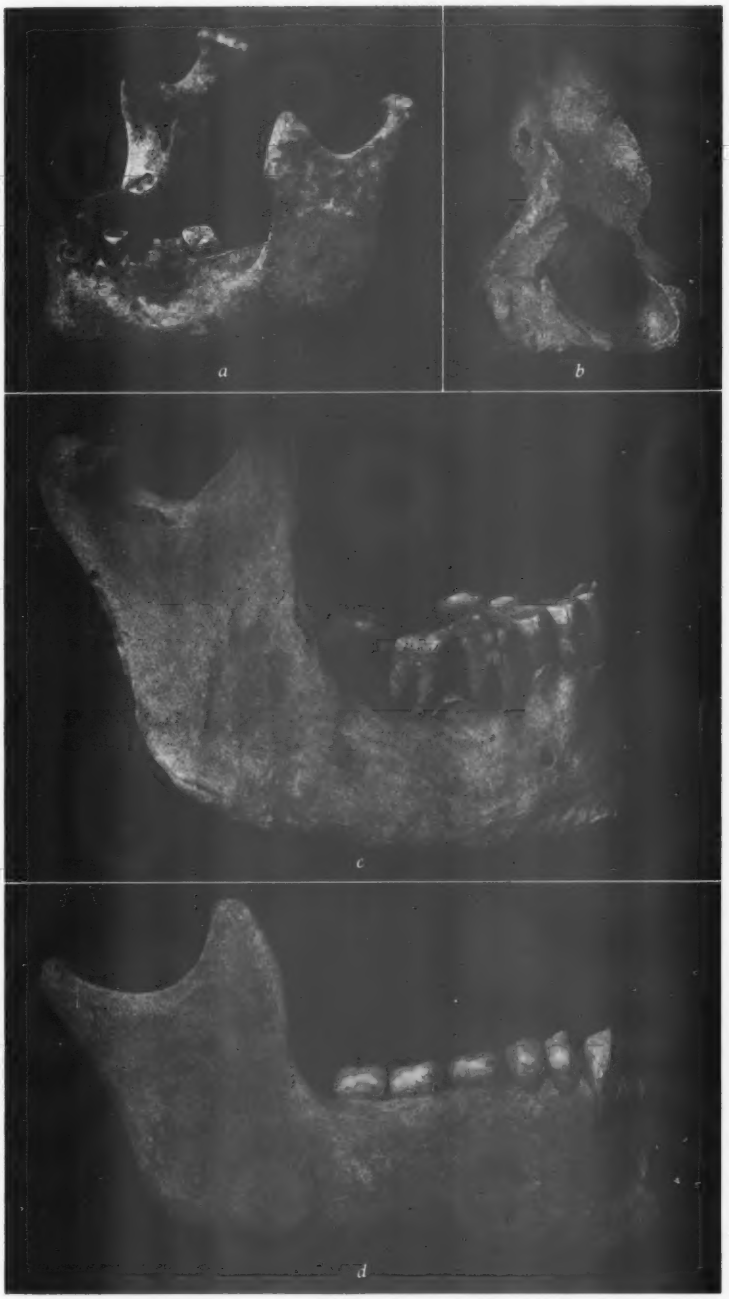
I have found pulp exposure widely effected by attrition caused by the admixing of abrasives with food in its preparation by primitive peoples, exemplified by the California Indians[5] and other American tribes. Caries, prevalent in people of sedentary habits and carbohydrate diet, for which association there is overwhelming evidence, destroys the hard parts of the teeth and thus infects and exposes the pulp. Traumatic fracture of teeth, which occurs fairly frequently in primitive people, such as the Eskimo, is responsible for pulp exposure. Rarely, by extension, the inflammatory process which begins at the alveolar border, encroaches on and infects and destroys the pulp via the root apex. Periapical osseous lesions ensue from pulp exposure by any and all of these agents. In archaic Egypt, attrition was the primary cause of lesions of the facial bones. Paralleling the development of civilization, and directly concomitant with a more refined cuisine of the upper strata of Egyptian people, caries replaced attrition as the primary cause of alveolar abscess (periapical osteitis).

The pulps of the maxillary first molars are more frequently exposed than other teeth. The maxillary second molars are the next most frequently involved. In senile persons, the pulps of nearly all the maxillary teeth are exposed, with resultant lesions surrounding their roots; and the loss of teeth in the edentulous and nearly edentulous is traceable to this pernicious sequential process. No. 5125, male, 60, has the pulps of all the maxillary teeth except the third molars exposed through wear, with resultant periapical osteitis; and there are also four more osseous lesions from the same primary cause in the mandible.

The lesions vary in size from a few millimeters to 10 or even 15 mm. in diameter. A variant of the ordinary lesion is the radicular cyst (see radicular cyst); and, by direct extension, the pathologic process comes to involve the maxillary sinus with suppurative sinusitis ensuing (see maxillary sinusitis). The periapical lesion frequently fuses, with resorption of bone starting at the alveolar border (periodontoclasia). And, in the light of present medical knowledge, it is legitimate to assume that, by means of metastasis, the periapical osseous lesions have a causal relation with the prevalent osteoarthritis in Egypt.

Radicular Cyst.—This lesion is a variant of the chronic periapical abscess, and it is always associated with a pulpless tooth. Its development is contingent on two conditions: embryonic and infectious; i.e, the embryonic occurrence of epithelial rests in the dento-alveoloperiosteum, classically described by Malassez as *débris épithéliaux paradentaires;* and the entry of bacteria, which may stimulate the rests to proliferate. The epithelial cells proliferate into small spherical masses. These aggregations are doomed to central liquefaction, and the gradual accumulation of fluid within the central cavity produces pressure on the overlying

5. Leigh, R. W.: Dental Pathology of Aboriginal California, Univ. Calif. Publications, Am. Arch. & Ethnol., 23, p. 399.



Above, left: Fig. 11 (No. 4809).—Type mandible: low, broad rami; periapical osteitis resultant from attrition. Above, right: Fig. 12 (No. 5222).—Interior of left maxillary sinus; large fistula through floor. Center: Fig. 13 (No. 4895, male).—Type mandible: high, narrow ramus; advanced periodontoclasia; eversion of new bone. Below: Fig. 14 (No. 5050, female). —Fine example of predynastic type mandible.

bone, atrophy ensuing. The cortical covering may become attenuated to a parchment-like thinness. This type of cyst is well represented in this group of craniums. The cyst occurs more frequently about the lateral incisor than in connection with any other tooth. In No. 4799, a senile female, a cyst involves the teeth from the right central incisor to the second bicuspid. The facial wall is greatly bulged out and the floor of the right naris domed. No radicular cysts were observed in the mandible. No coronal (dentigerous) cysts occur in this collection.

Maxillary Sinusitis, Chronic.—More than 10 per cent of these craniums had old fistulas draining the maxillary sinus through the alveolus of a molar tooth, or the former sites of teeth. No. 5222 has a fistula leading from each sinus through the alveolus of the second molar. The left fistula measures 10 by 5 mm. The apertures of such fistulous tracts are well-defined; the margins are sclerosed and rounded. The diameter varies from 1 to 3 cm; chronicity is obvious. The patent cause of disease of these sinuses is infection by extension from periapical dental lesions in close proximity to the sinus floor. And, reversing the order of genesis, the periapical lesion resulted from an infected necrotic pulp, which, in turn, was exposed to the oral environment through the ravages of attrition, rarely caries. This skeletal material affords ample evidence of the far-reaching sequelae of infection atriums via the teeth.

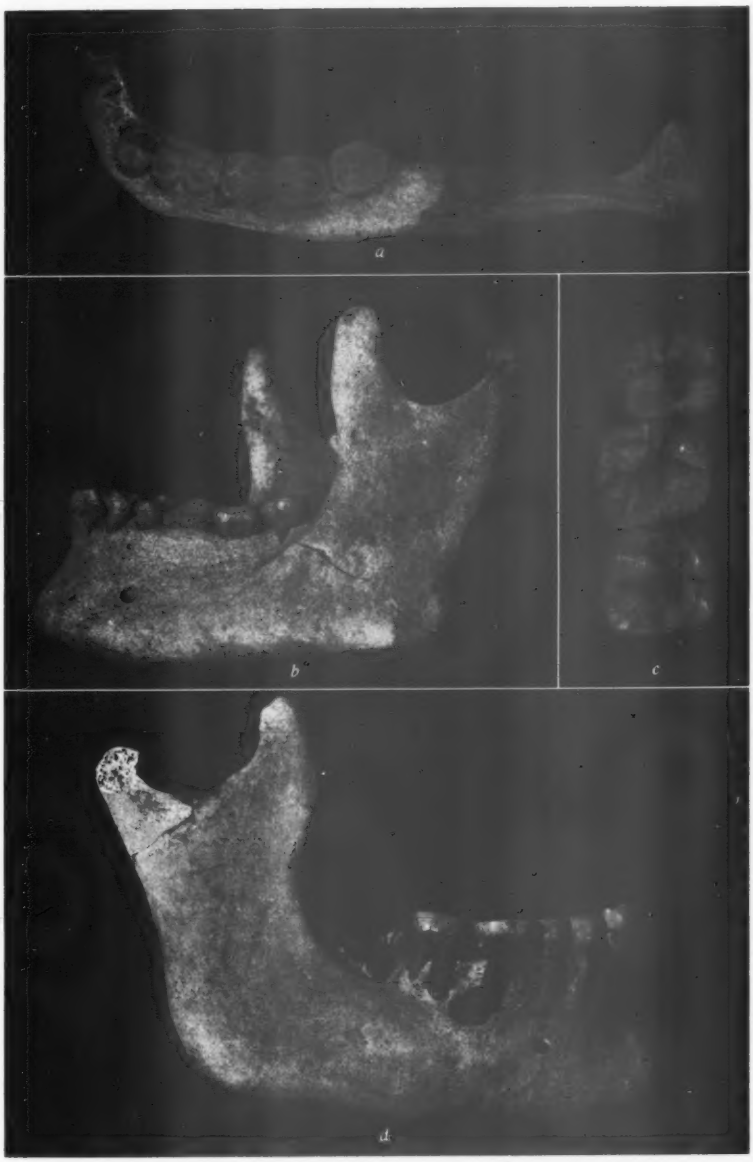
Retained Deciduous Roots.—Fragments of roots of deciduous molars are fairly frequently found encased in the alveolus about the bicuspids. Physiologic resorption by giant-cell activity ceased before the destruction of these spicules. They are caught rigidly in the new alveolus formed around their successors, but they appear to be physiologically innoxious. They are mistaken by some observers for supernumerary or anomalous dental elements.

Extraneous Accretions and Periodontoclasia.—The tenaciousness with which lime deposits adhered to the gingival margin of the teeth of some of the Egyptians is attested by their presence *in situ* after the lapse of several millenniums. Accretions of a whitish hue are very hard; more friable material has a brownish coloration and claylike texture. Pendulous aprons of the foreign material overlap the labial gingival tissue of the mandibular incisors and the lingual tissues of the molars.

With respect to accretions, F. Wood Jones[6] notes: "It is not until the era of the alien settlers of the Byzantine times that dental disease becomes really common and assumes anything like its modern frequency of incidence. It is in this period that accretions upon the teeth are sizeable."

Periodontoclasia is chronic destructive degeneration of the investing tissues of teeth eventuating in exfoliation. Alveoloclasia is the breaking down of the osseous support, observable in skeletal material. It is to be said there is a physiologic recession of the alveolar crest from childhood to senility. The latter is to be distinguished from pathologic resorption. The distance from the enamel margin to the alveolar crest gradually increases. This increase is, in effect, a continued physiologic eruption of the teeth, partially compensatory for the shortening of the teeth by wear. In a child of 7, the distance at the mesiofacial angle of the maxillary first molar is 0; at 16 years of age, about 0.5 mm. At 30, the distance

6. Jones, F. W., and Smith, G. E.: Archaeological Survey of Nubia, Report for 1907-1908, Report of the Human Remains, Vol. 2, Cairo, 1910.



Above: Fig. 15 (No. 5250).—Occlusal mosaic; second degree attrition. Center, left: Fig. 16 (No. 5222, male).—Archaic type mandible; exceptionally high coronoid process. Center, right: Fig. 17 (No. 5056).—Occlusal aspect of maxillary molar teeth; Carabelli's cusp. Below: Fig. 18 (No. 5163, female).—Archaic type mandible: dental caries and periapical sequelae.

is, with healthy conditions, 1.5 mm. At 55, the distance may, with healthy tissues, be about 4 mm.

Pathologic degeneration may be discerned not only in greater exposure of the tooth root, but also by resorption of the cancellous as well as the cortical alveolus, which extends to the bifurcation, and to the apices eventually. There is evidence in this Egyptian group that accretions, periodontoclasia and caries are not incompatible, as is often stated. The presence of both accretions of considerable size and caries is strongly indicative of reduced function. If the teeth have been used vigorously, which generally obtained in archaic Egypt, and death came before attrition exposed the pulp or destroyed contact, the teeth are free from both caries and alveolar degeneration. But periapical osteitis following fourth degree attrition abets resorption both about the apex and at the alveolar border. In these craniums, loss of some teeth has induced alveolar resorption of neighboring teeth, afunction, malfunction, migration, further accretions and extended alveoloclasia. But it is patent that accretions are the alpha of proximate causes of periodontoclasia.

There are no predynastic skulls with typical alveolar resorption that had its origin at the margin. A skull from Coptic times, *circa* 300 A.D., male, aged 40, has immense brownish friable accretions on the molars particularly. The teeth show very slight wear, both afunctional manifestations; and, concomitantly, the alveolar process is resorbed to the bifurcations of the roots. With the advent of Greek influence in Egypt, the cuisine became luxurious and refined. It is from the Coptic era that the most pronounced cases of degeneration of the investing tissues accompanied with enormous extraneous accretions and evidencing afunction came. Persons affected were 45 or older at death. The molars were involved most frequently.

Exfoliation and Senility.—Teeth, or parts thereof, surviving middle life are subjected to the cumulative effect of pernicious influences as old age approaches. A trio of forces—disease, function and senescence—converge to the ultimate exfoliation of the teeth. First, periapical lesions consequent on pulp exposure, degeneration of the alveolar margin caused by the presence of accretions and other conditions, continue and frequently fuse in the general process of bone resorption. Secondly, in the last stages of attrition, the force is upward and inward, producing outward pressure on the apices of the maxillary teeth, which induces atrophy and resorption of the facial cortex. The economy with which tooth remnants function exemplifies continuing adaptation of an organ to requirements. Thirdly, accelerating these processes is the physiologic state of calcium resorption now taking place in the life cycle of the individual, a salient phase of the involution of senescence. Verily, the teeth are transitory organs not designed to be taken to the grave by the extremely senile. But the individual has ample time to become adapted to the inevitable; and these resorptive processes, more evident in the maxillae of ancient Egypt, were neither unduly painful nor the causal factors unknown and mysterious as set forth by Ruffer.[7] In the order of frequency of loss, the maxillary third molar is first; the first molar, second; the second, third.

Osteo-Arthritis.—Osteo-arthritic lesions, including osteo-arthritis deformans and spondylitis deformans, are evident throughout the Nile valley and from predynastic epochs to the present time. The

7. Ruffer, M. A.: Abnormalities and Pathology of Ancient Egyptian Teeth, Am. J. Phys. Anthropol., 3:335-382, 1908.

commonest form of this pathologic process is that in the spinal column, spondylitis deformans. Varying numbers of vertebrae of the lumbar, dorsal or cervical regions may be immovably coalesced. The Hearst Expedition at the Gizeh Pyramids recovered one body in which there was a complete union of every vertebrae. In other joints, the changes usually consist of (1) eburnation of bone on the articular surfaces or (2) roughening outgrowths (bone hyperplasia). There are many skeletons in the California collection with severe arthritic changes.

F. Wood Jones,[6] in his report on Nubia, in speaking of arthritis deformans, says it "is fairly abundant at all periods and affects most commonly the shoulder and the hip: but scarcely any joint—not even excepting the temporomandibular joint—has failed to present several examples of the disease." I observed several occurrences of osteo-arthritis of the temporomandibular joint in this collection. No. 4803 (Figs. 4-5) is typical. There is erosion and porosis of the superior and posterior surfaces of the left condyle; and a dense, macroscopically amorphous, exostosis 2 mm. in thickness covers the glenoid fossa and eminentia articularis. There has been considerable compensatory adaptation in the mandibular movement, resulting in fourth degree attrition of several teeth on the left side.

With respect to etiology of these osteo-arthritic lesions, it may be significant that in the very case illustrated, the person harbored an old periapical abscess; and several others developed from teeth whose pulps were exposed by malfunction from the arthritis itself—a vicious cycle. Paradental bone lesions occurring in the same skeletons as arthritic changes suggested to Ruffer[7] that the former may have a primary causal relation to the latter. Elective localization of infectious processes may have been the inciting cause. The infection may have found atria into the body via dental lesions, the genito-urinary tract or otherwise. Hard labor and dietary factors may be named. F. Wood Jones[6] has this to say relative to cause: "The causal factor of the disease is essentially one of environment, and not race." It was due, he thinks, to the mode of life of the indigenous people, as well as the immigrants, in the Nile valley. Their constant dabbling in the waters of the Nile was not without deleterious effects on the osteo-arthritic system.

Syphilis, Rachitis and Lesions on Parietal Bosses.—There are no dental stigmas of congenital syphilis in the collection of craniums examined; nor is there any lesion of the calvarium or facial bones which remotely resembles specific lesions. Hypoplastic enamel and atypical teeth are extremely rare. Neither Smith[8] nor Jones found evidence of syphilis or rickets in any part of the Nile valley.

On the parietal bosses, usually bilateral, of many skulls is a flattened or sometimes indented area which is apparently caused by intentional pressure acting over a considerable period of time. These areas are triangular and evidence long continued vascularity, periosteitis and ulceration, with sinking in of the outer table, the inner table usually being unaffected. Lesions occur on females, and they are known to have been the bearers of the water jars.

Dental Operative Interference.—In the Hearst Egyptian collection, there is absolutely no evidence of dental operative interference. In many persons, diseased remnants of teeth could have been eliminated with the simplest gesture, but nothing was done to get rid of unsound teeth. The utmost biologic economy is

8. Smith, G. E., and Dawson, W. R.: Egyptian Mummies, London, 1924.

shown in the retention and functional utilization of diseased and frail teeth. Attrition often shortened the maxillary first molars beyond the pulp chamber; large osseous lesions frequently encompassed their apices; the position of the roots shifted as the plane of attrition approached the cervix, with resultant atrophy of the bone overlying the apices through untoward pressure; yet active function continued. No. 5065 is typical. This condition is common to many primitive people.

My observations concerning the absence of dental surgical measures are in agreement with the findings of Smith and Jones. In "Egyptian Mummies,"[8] page 158, the former states: "There is in no case the slightest suggestion that any operative measures were adopted in order to cope with dental trouble and in spite of frequent statements to the contrary, tooth-stopping was never practiced in ancient Egypt." In the "Archaeological Survey of Nubia," page 283, Jones says of the people of the upper Nile valley: "At no period do the teeth of any body show signs of the dentist's handiwork."

The literary evidence from ancient Egypt is of similar import. It is evident from the prescriptions in the Ebers and other papyri that dental therapeutic measures were doubtless practiced; but with reference to definitive operative procedures, such as extraction of teeth, filling operations or prosthesis, no literary allusions have been discovered. The Ebers papyrus mentions no dental operations, though operations on other parts of the body are detailed.

Professors Ebers and Schmidt, Egyptologists, say that they found nothing which could be attributed to the work of dentists. Similarly, Virchow, the craniologist and pathologist, found no evidence of the practice of dental surgery or art. Guerini[9] says that J. R. Mummery made a careful research on purported dental art in ancient Egypt and reported negative findings.

CORN IN EGYPT

Man, like the bear, is naturally omnivorous. The ability to subsist on a wide range of edibles has been of decided advantage to both species in their rise, their spread over wide latitudes, their dominion and their survivial. Primitive man without trade subsisted exclusively on the fauna and flora of his limited habitat; and the extent and variety of his sustenance were determined by his ability to retrieve and, to some extent, by his ingenuity in preparing food. Adaptation of a tribe or race to a geographic area invariably entailed specialization in one or two main articles of diet, staples, which were supplemented by occasional or seasonal foods.

The predominant subsistence in the Nile valley from archaic times has been graminivorous. Cereals have been the staples. Analysis of the intestinal content of predynastic man has identified husks of indigenous barley uniformly and, to a lesser extent, millet. Small root-tubers have been found both in very ancient burial pots and in the alimentary tract. Also copious remains of fish were found as well as mammalian bones. Fish was abundant in the waters of the Nile, and game along its banks.

But primitive man inhabiting the Nile valley was ingenious; this race on this soil and in this climate evolved possibly the first distinctive civilization. This native power of invention, fortunately situated on rich arable lands in a salubrious climate, possessed an area singularly isolated by natural barriers which prevented its

9. Guerini, Vincenzo: History of Dentistry (English translation), Philadelphia: Lea and Febiger, 1909.

culture from being molested until after it was well established. The inventiveness and industry of the Egyptians so nurtured the natural resources for food production that, with the flowering of civilization, the diet became varied, luxuriant and refined. The early Egyptians were probably the first to make metal fishhooks. Very early, they domesticated sheep, goats and cattle—truly a great stride of primitive man toward dominion. There is archaeologic evidence that this people introduced the cultivation of barley. Certainly, they devised the technic of irrigation; and probably they were the first people to use cow's milk as food for human beings.[2] Here, then, are the fundamental inventions for a rich and varied diet.

Breasted[10] summarizes the diet for the Old Kingdom, *circa* 3000 B.C., as follows: "The food was rich and varied; we find that even the dead desired in the hereafter 'ten different kinds of meat, five kinds of poultry, sixteen kinds of bread and cakes, six kinds of wine, four kinds of beer, eleven kinds of fruit, besides all sorts of sweets and many other things.' "

It is to be noted that in Byzantine and Coptic eras, the teeth functioned less than in predynastic times. Large accretions formed on the teeth, and periodontoclasia and caries contributed to tooth destruction. It may be noted in passing that many of the therapeutic recipes (several of which are dental) recorded on the medical papyri included for their vehicles dough, honey and milk, all conducive to dental caries, if their débris remains on the teeth. It is to be said, finally, that as far as the health and preservation of the teeth are concerned, the mode of preparation of food is primary. In Egypt, in predynastic times, abrasives were admixed with the food being prepared, with resultant destructive attrition. When the Ptolemies ruled, the cuisine was refined, afunction was abetted and caries and alveolar degeneration were rampant.

10. Breasted, J. H.: History of Egypt from Earliest Times to Persian Conquest, New York: Charles Scribner's Sons, 1926.

EXPLANATION OF ILLUSTRATIONS

Figure 1 (No. 4834) shows the norma basilaris of a skull from a male, aged about 70; Naga-ed-Der, sixth to twelfth dynasties. A high elliptic palate accommodates a normal arch. No teeth were lost antemortem. There is no evidence of caries. The incisors were fractured postmortem. The teeth show advanced attrition, the plane of wear slants upward from the facioclusal angle toward the linguocervical margin of the crown. Attrition, resultant from an abrasive diet, pulp exposure therefrom and pathologic sequelae are typically represented in this skull. Centrifugal apposition of secondary dentin in the bicuspids has prevented pulp exposure by centripetal wear. The first molars are worn to the floor of the pulp chamber. After exposure and necrosis of the pulp, chronic periapical abscesses developed, with draining fistulas through the alveolar process. The aperture on the distal aspect of M^1 may be noted.

Figure 2 (No. 4809) shows the norma verticalis of a typical Egyptian skull, from a female, aged about 75; Naga-ed-Der, sixth to twelfth dynasties. This characteristic vertex is pentagonoid or coffin-shaped. The frontal region is narrow between the temples, but with defined frontal eminences. The lateral boundaries are straight lines diverging posteriorly. The posterior margin is roughly triangular. On each parietal boss of this skull is a triangular lesion. In life, this surface was unduly vascularized, and periosteitis and sinking in of the outer table ensued. The condition was doubtless brought on gradually through pressure from a head burden. It is an ethnic mark found throughout the Nile Valley, occurring in females who were known to be the carriers of water jars.

Figure 3 (No. 4894) presents the lateral

aspect of the skull of a male, aged about 40; Naga-ed-Der, Copt, early Christian epochs. The skull is frail, of fine texture and scaphoid, but with a typical narrow forehead and occipital eminence. The palate is broad. There is no dental attrition, but heavy brownish accretions on the molars, with concomitant resorption of the alveolus, indicate periodontoclasia. The crowns of the left cuspid and first bicuspid have been destroyed by caries. The dietary habits have evidently been quite different from those of earlier epochs. Reduced function of the teeth is obvious.

Figure 4 (No. 4886) presents the lateral aspect of the skull of a female, aged about 35; Naga-ed-Der, Old Empire. On the lateral aspect of the left maxilla involving the alveoli of the second and third molars is a hemispherical depression 2 cm. in diameter. The margins are sharp, the walls a fine reticulum. An aperture opens into the maxillary sinus. Evidence of osteoperiosteitis extends from the depression over the posterior surface of the maxilla, under the zygoma. The character of this lesion precludes chronic periapical abscess or its cystic variant. The destruction probably resulted from the growth of a neoplasm, possibly fatal.

Figure 5 (No. 5122) shows the norma lateralis of the skull of a female aged about 45; Mesopotamia, Middle Empire. A typical Egyptian profile: prominent occipital eminence, orthognathous face, arched nasal bridge, symmetrical mandible. Attrition of teeth and resorption of alveolar border are evident. A peg-shaped process 4 by 7 mm. projects forward from the internal angle of the articular surface of the right condyle. A complementary area is marked on the eminentia articularis.

Figure 6 (No. 4803) presents the lateral aspect of a skull and mandible with integument and textile wrappings *in situ* on the face of a male, aged about 65; Naga-ed-Der, sixth to twelfth dynasties. Severe dental attrition has exposed the pulp of the upper first molar, with resultant chronic periapical osteitis. Resorption of the border of the alveolus investing the molar teeth has occurred. Erosion of the upper and lateral surfaces of the condyle is evident. Chronic osteo-arthritis has involved the left temporomandibular articulation.

Figure 7 (No. 4803) presents the basilar aspect of the skull shown in Figure 4. The first molars have been worn beyond the floor of the pulp chambers. Attrition has also exposed the pulps of the left first bicuspid and cuspid, with resultant combined fistulas opening on the palate. The left lateral incisor exhibits periapical osteitis on the facial aspect. No teeth were lost antemortem. In the left glenoid fossa is apposed hyperplastic bone from 1 to 3 mm. thick. This new bone is extremely dense. Differentiation of eburnated new bone from the fossa may be noted on its posterior margin. Apposition of bone in the fossa is complementary to resorption of the head of condyle, shown in Figure 4, both resultant from a long-continued inflammatory process. Limitation of function has produced the asymmetry of attrition noted above. There may have existed a relation between the chronic periapical osteitis about the first molars and the severe osteoarthritis of the mandibular joint.

Figure 8 (No. 5189) presents the lateral aspect of the mandible of a female, aged about 35; Giza, Old Empire. This jaw is dissimilar to the predynastic type. The body is not high; the ramus, high but narrow. The angle is obtuse and rounded and the anterior border of the ramus is nearly straight. In the mental region, the incisive fossa is not defined, and the anterior surface forms an obtuse rather than a right angle with the occlusal plane. This is a distinctive type mandible indicating a later stock in the Nile Valley.

Figure 9 (No. 5160) presents the lateral aspect of the mandible shown in Figure 10. The accretions are seen as pendulous aprons over the labial gingival tissues causing loss of the first molar on each side and the right central incisor, antemortem. The alveolar process is extensively resorbed from the remaining molar teeth.

Figure 10 (No. 5160) presents the frontal aspect of the mandible of a male, aged about 50; Giza, Old Empire. Calcareous accretions overlap the alveolar border.

This extraneous material irritated the gingivae and alveolar border, resorption resulting. There is a postmortem fracture at the symphysis.

Figure 11 (No. 4809) shows one type of Egyptian mandible. The body is short and the rami are low and broad, with anterior borders of sigmoid outline. The coronoid process is blunt; the notch, a shallow crescent. No teeth were lost antemortem. Attrition exposed the pulp of the left first molar, with consequent chronic periapical osteitis.

Figure 12 (No. 5222) shows the interior of the maxillary sinus of a male, aged about 55; Giza, Old Empire. There is a fragment of the left maxilla on the floor of the sinus in the region of the molar teeth. Through the floor is a large oval fistula 10 by 5 mm. The margins of the aperture are well rounded and sclerosed, this indicating chronicity. The infection atrium via the apices of the first and second molars was consequent on pulp exposure through attrition. The external surface of the maxillary sinus evidences an osteoperiosteitis. The right maxillary sinus is similarly involved via the lingual root of the second molar, producing an old fistulous opening 6 by 4 mm. in diameter.

Figure 13 (No. 4895) presents the lateral aspect of the mandible of a male, aged about 60; Naga-ed-Der, sixth to twelfth dynasties. A later type of mandible is evident. The ramus is high and narrow with high sharp coronoid process and deep sigmoid notch. The anterior border is straight. The angle is roundish and obtuse and the gonions are everted. The mental eminence is well developed. The denture tends to be a transitory organ. The posterior teeth are involved in periodontoclasia to the point of exfoliation. There are heavy brownish accretions on the lingual surfaces. A thin everted collar of new bone is evident at the margin of the resorbing alveolus. The sharp lamina is characteristic of this destructive inflammatory process. The lower teeth are not worn nearly so much as the upper teeth.

Figure 14 (No. 5050) presents the lateral aspect of the mandible of a female, aged about 20; Naga-ed-Der; an excellent example of the predynastic type. The jaw is characterized by its symmetry, definition of outline, refinement of structure and surface detail, and the harmony and efficiency of the implanted teeth. The body is amply deep, the mental protuberance triangular. The ramus is broad, the angle well defined. The gonions are mildly inverted. The anterior border of ramus is smoothly notched beyond the third molar. Above, a convexity terminates in the coronoid process. The sigmoid notch is a broad, perfect crescent. The articular surface of the condyle is refined. The musculature was not too heavy. The dental arch is a broad ellipse with an ideal arrangement of its units. The enamel is without fissures and of a pearly hue. The specimen being a young female adult, there is maturity without the advanced effects of function, ravages of pathologic processes or the atrophy of senility. The enamel is clean and evidences slight wear. From this mandible, the norm of the distance from the enamel border to the alveolar crest may be taken —1.5 mm.

Figure 15 (No. 5250) is an occlusal view of the left mandibular teeth of a male, aged about 40; Giza, Old Empire. Second degree attrition is exemplified: The dentin is exposed at the positions of former cusps and islands of enamel, formerly at the bottom of grooves, form a mosaic with the contrasting dentin.

Figure 16 (No. 5222) presents the left lateral aspect of the mandible of a male, aged about 55. This is essentially the archaic type mandible with some variation: The ramus is higher and the coronoid process is exceptionally high. Other morphologic features are typical: Definite, almost right angle gonions are not everted; the sigmoid notch is a symmetrical crescent; the anterior border of the ramus presents a large concavity at its base, surmounted by a convexity.

Figure 17 (No. 5056) is an occlusal view of three upper left molar teeth of a female, aged 18; Giza, Middle Empire. These teeth are large and the enamel is remarkably light colored. There is a rapid diminution

in size from first to third. The Egyptian dentition is characterized by a constant occurrence of Carabelli's cusp on the upper first molar. This anomalous tubercle is sizeable on this first molar, and outlined on the second. While the cusps and grooves are well marked, there is a characteristic softness in their lines.

Figure 18 (No. 5163) presents the lateral aspect of the mandible of a female, aged about 45; Masheikh, Middle Empire. This type mandible is archaic. It is characterized by a definite angle, and a ramus whose anterior border has a marked sigmoid curvature. Several teeth with supporting bone have been extensively destroyed by caries and its periapical sequelae. In the first molar, caries at the distocervical border of the enamel has extended to the pulp, with consequent chronic periapical osteitis. An old fistula with sclerosed border opens from the distal root. Four osseous lesions of identical cause are in this jaw.

NEGLECTED FACTORS IN THE STUDY OF DENTAL CARIES*

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WHILE it is my opinion that the time-honored chemicoparasitic theory of dental caries does not require justification, there is no doubt that it has been the target for a great deal of criticism in recent years, and that much publicity has been given to research which supposedly refuted it. In the face of this criticism, a number of advocates for the local theory have transferred their allegiance to causes which seemed to offer more hopeful attacks on the problem. This paper does not offer encouragement to any who think that a full understanding of this condition is close at hand, but is addressed rather to those who believe that the causes of most diseases readily susceptible of solution were discovered in the early days of bacteriology, and that the understanding of others may now most profitably be sought in the interaction of a number of factors. Perhaps, in the unique disease of dental caries, there is more need for this point of view than in any other.

Since it is almost axiomatic that "it is at the enamel surface alone that the process of caries is able to be prevented or checked,"[1] it seems profitable to focus any attempts to understand its cause or to effect its cure on conditions having a direct influence on the initiation of the process. For the sake of simplicity, the discussion will be taken up under the following headings: 1. The susceptibility of the teeth to destruction. 2. The significance of plaques and films. 3. The rôle of bacteria in caries. 4. The effects of saliva on tooth decay. 5. The influence of food in altering the environment of the teeth. In evaluating these factors in dental caries, those which have been dealt with fully elsewhere will not be

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1. Pickerill, H. P.: Prevention of Dental Caries and Oral Sepsis, New York: Paul B. Hoeber, Inc., 1924.

discussed, but attention will be directed rather to some neglected but important aspects of the problem.

SUSCEPTIBILITY OF THE TEETH TO DESTRUCTION

It is a common belief that the resistance of a tooth depends on its content of inorganic salts, and that those teeth which have a high content of such material are more resistant to caries than those with a lesser amount. This view rests almost exclusively on findings adduced by Pickerill[1]; but the consideration of other evidence suggests the possibility of a different conclusion. In spite of the observations of Mellanby,[2] the fact that definite differentiation has not been made between true caries and dystrophic enamel change leaves doubt as to whether hypoplastic teeth are more liable to carious destruction than those of normal structure. Indeed, the manner in which hypoplastic teeth survive, notwithstanding the great irregularities of their surfaces and the greater accumulation of food on them, suggests that, in themselves, these teeth may sometimes have an added measure of resistance. The evidence on this point is as follows: Black[3] stated that "neither the density, nor the percentage of lime salts, nor the strength, is in any degree a factor in predisposing the teeth to caries, or in hindering its inception or progress." Beust[4] and Wallace[5] have commented on the remarkable ability of hypoplastic teeth to withstand destruction. Shaw[6] has pointed out that hutchinsonian teeth are almost always free from caries, Hatton[7] that mottled enamel is more resistant than normal and Bödecker[8] and Hanke[9] that hypoplastic teeth show no increased susceptibility to caries. McKay and Rose[10] found that although one of two groups of children had eleven times more hypoplastic teeth than the other, the incidence of caries was practically the same in the two. Hess and Abrahamson[11] found that the incidence of caries in the permanent teeth of rachitic children was from 7 to 10 per cent less than in nonrachitic children. Colyer[12] and Willams[13] have pointed out that animals are practically immune to caries, although formative defects are the rule in their teeth. If we add the common clinical observation that defective teeth often outlast their normal neighbors, we are impelled to inquire more closely into the relationship between the structure of the teeth and their ability to withstand destruction.

It is generally accepted that the enamel is composed of both organic and inorganic material. Since the latter constitutes over 98 per cent of the total mass, it alone has received consideration in most studies of dental caries. Hence, the pos-

2. Mellanby, May: Brit. D. J., 48:1481 (Dec. 15) 1927.

3. Black, G. V.: D. Cosmos, 37:353 (May) 1895.

4. Beust, T. B.: D. Cosmos, 53:724 (June) 1911; trans. from Arch. f. Zahnheilk., April, 1911.

5. Wallace, J. S.: D. Items Int., 55:16 (Jan.) 1933.

6. Shaw, J. M.: So. Afr. M. J.; reprinted New Zealand D. J., 28:22 (Sept.) 1932.

7. Hatton, E. H.: Caries: Résumé of Knowledge of Its Action, Together with Some of the More Recent Research Work, J.A.D.A., 19:1400 (Aug.) 1932.

8. Bödecker, C. F.: D. Cosmos, 71:586 (June) 1929.

9. Hanke, M. T.: Diet and Dental Health, University of Chicago Press, 1933, p. 26.

10. McKay, H. M., and Rose, S. F.: Lancet, 2:1230 (Dec. 5) 1931.

11. Hess, A. F., and Abrahamson, H.: D. Cosmos, 73:849 (Sept.) 1931.

12. Colyer, Frank: Four Lectures on Abnormal Conditions in Teeth of Animals, London: Dental Board of United Kingdom, 1931.

13. Williams, J. L., Quoted from Goadby, K. W.: Mycology of Mouth, London: Longmans Green & Co., 1903, p. 140.

sible significance of the organic cuticle, the lamellae and the rod sheaths will be discussed at this point.

Inorganic Portion of Enamel.—No reliable information regarding the chemical composition of various parts of the enamel is available. Physical investigation has shown that the outer third is six times as hard as the inner third.[14] It has also been shown that the peripheral surfaces of the enamel prisms are different from the axial portions in that they have a definite crystal orientation.[15] The significance of these factors in the resistance of the tooth has not been ascertained, but the denser surface and the oriented crystals of the enamel rods suggest an enhanced ability to withstand acid decalcification.

Organic Cuticle of Enamel.—While the existence of a cuticular structure about the freshly erupted tooth is generally admitted, opinions are divided as to its presence in later life. Under favorable conditions, it will undergo keratinization, but may be lost before this change is complete, or even afterwards, if masticatory or traumatic forces come to bear on it. Wherever this superficial layer persists, we have a membrane which is resistant to the action both of acid and of proteolytic enzymes. On the basis of its permeability, it will serve as an efficient barrier between the inorganic portion of the tooth and decalcifying acids on the surface. An illustration of such an effect is seen in certain histologic procedures wherein the speed of enamel decalcification in acid can be regulated by the permeability of a celloidin layer which has been applied. The permeability of the cuticular remnants on the tooth surface is not known, but their effect in delaying or preventing decalcification in inaccessible areas, such as fissure bases and minute surface depressions, is a possibility which may be significant.

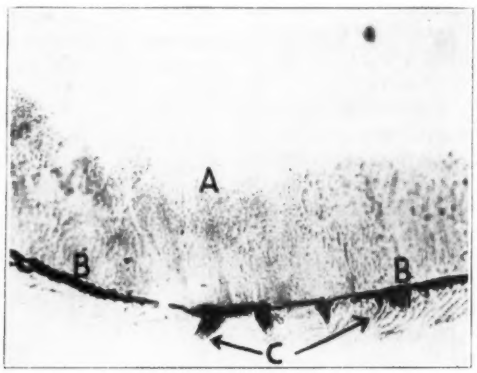

Fig. 1.—Section of membrane obtained by surface decalcification of tooth crown, showing slightly stained micro-organisms (*A*), acid-resistant pigmented layer (*B*) and enamel rod sheaths, some of which are pigmented and consolidated (C). (×210.)

14. Hodge, H. C., and McKay, Harold: Microhardness of Teeth, J.A.D.A., 20:227 (Feb.) 1933.

15. Cape, A. T., and Kitchin, P. C.: Histologic Phenomena of Tooth Tissues as Observed Under Polarized Light; with Note on Roentgen-Ray Spectra of Enamel and Dentin, J.A.D.A., 17:193 (Feb.) 1930.

Pickerill,[1] Leigh,[16] Mummery[17] and Malleson[18] have suggested the protective value of this structure, the last observer noting that caries did not occur in fissures in which it was intact. Gottlieb[19] showed that teeth resisted decay where the cuticle and outer part of the lamellae were fully hornified, presumably because of their decreased permeability to acids, but that decay originated where the cuticle was absent or defective. This worker's laboratory findings were supported by clinical observations.

My findings[20] resemble those recorded by Gottlieb, but have been given a somewhat different interpretation. Films removed from old immune teeth showed a structureless layer, situated between a bacterial plaque on the outside and an inner zone of changed enamel tissue. This sometimes resembled keratin, but more frequently appeared as a dense pigmented mass. This layer probably represented the remains of the enamel cuticle, to which had been added the superficial portions of the organic enamel matrix. This matrix, according to Nishimura's work[21] and our own observations,[20] is bulkier at the surface than in the depth of the enamel, and consequently more likely to undergo the process of consolidation, which will be explained hereafter. It was suggested that as this layer increased in thickness (the result of decalcification or surface accretion), it eventually became almost impermeable to acids and, unless disturbed, ultimately served as a "passive defense" against decalcification and caries.

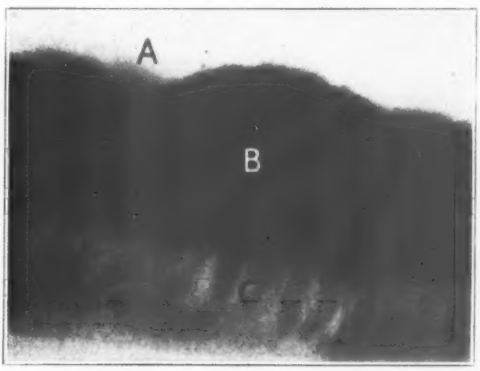

Fig. 2.—Section of membrane obtained by surface decalcification of tooth crown, showing bacterial plaque (*A*) and thick acid-resistant pigmented layer (*B*), which is apparently in continuity with pigmented enamel rod sheaths (*C*). (×1000.)

This hypothesis explains the pigmentation and change seen on the superficial portion of the enamel rods in most tooth sections. It also accounts for the thickening of the enamel cuticle seen by

16. Leigh, R. W.: J. D. Res., 5:197 (Dec.) 1923.

17. Mummery, J. H.: Brit. D. J., 47:473 (May) 1926.

18. Malleson, H. C.: Brit. D. J., 46:907 (Aug.) 1925.

19. Gottlieb, Bernhard: Ztschr. f. Stomatol., 19:129, 1921.

20. Bibby, B. G., and Van Huysen, Grant: Changes on Enamel Surface, a Possible Defense Against Caries, J.A.D.A., 20:828 (May) 1933.

21. Nishimura, T.: Schweiz. Monat. f. Zahnheilk., 36:2, 1926.

Leber and Rottenstein[22] at the point where caries was supposed to be commencing, the accretions observed by Miller,[23] the increased staining observed by Malleson[18] and the thickening which Beretta[24] claimed was concomitant with increasing age. The fact that this condition was most frequently observed by us in the sound teeth of old people indicated that it was a sign of resistance and suggested strongly that all changes seen on the enamel surface were not commencing decay. In addition, the brownish pigmentation by which this change is so often accompanied might well explain the darkening of the teeth with age and the relative immunity of dark and yellowish teeth to caries.[25]

Lamellae.—The lamellae have frequently been incriminated as the starting point of caries. The observations of Gottlieb[19] and Orbán[26] showed that they were frequently hornified in their external portions and hence suggest that they might act as efficient defenses against the destructive action of acid-forming or proteolytic organisms.

Enamel Rod Sheaths.—Continuity between the enamel rod sheaths and the enamel cuticle has been established by Miller,[27] Nishimura,[21] Williams,[28] Bö-

Fig. 3.—Section (prepared by Rudolf Kronfeld) showing pigmentation extending in a direction parallel with the enamel rods, and the apparent persistence of the enamel rod structure throughout the pigmented area. (Reproduced by permission of Lea and Febiger.)

22. Beust, T. B.: D. Cosmos, 54:316 (March) 1912.

23. Miller, W. D.: Micro-Organisms of Human Mouth, Philadelphia: S. S. White Dental Mfg. Co., 1890, p. 165.

24. Beretta, Arturo: Stomatologia, No. 9, 1914; abstr. D. Cosmos, 57:584 (May) 1915.

25. Bödecker, C. F.: Internat. J. Orthodontia, 19:386 (April) 1932.

26. Orbán, Bálint: Histology of Enamel Lamellae and Tufts, J.A.D.A., 15:305 (Feb.) 1928.

27. Miller, W. D.: D. Cosmos, 44:425 (May) 1902.

28. Williams, J. L.: D. Cosmos, 69:123 (Feb.) 1927.

decker,[29] Fish,[30] Cape and Kitchin,[15] Malleson[18] and us.[20] These findings indicate that the enamel rod unit is completely invested in organic material which, by analogy with Gottlieb and Orbán's findings in the enamel lamellae, one might expect to find keratinized at least in its outer portions. That this is so is indicated further by the chemical analyses of Rosebury and Gies[31] and the staining reactions of Chase[32] and Karshan.[33] This point of view is held by Fish,[30] Williams[28] and Nishimura.[21] Gysi[34] has pointed out the possible significance of the resistance of these structures to acid. It may be noted here that besides being resistant to acid, these structures would also be resistant to enzymes[35] of proteolytic bacteria.

Since Malleson[18] and Gottlieb[19] showed variations in the enamel cuticle, it is reasonable to infer that differences in the nature of the rod sheaths and in their permeability to acids and resistance to proteolytic enzymes would occur. The perfect tooth would have enamel rods encased in an entire and fully cornified membrane, which, although too fine to withstand trauma, would offer some resistance to the spread of decalcification. Hence, these sheaths and the walls of the neighboring enamel rods would serve as a limitation to the lateral spread of caries, and one might expect to find caries advancing in the direction of the enamel rods. That such is the case has been indicated by the microscopic observations of Williams[36] and Bödecker,[37] has been remarked on by

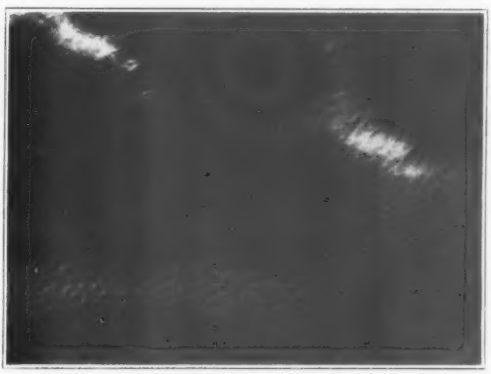

Fig. 4.—Decalcified section from pigmented cavity in enamel, showing persistence of enamel rod structure. (×430.)

29. Bödecker, C. F.: J. D. Res., 5:27 (Feb.) 1927 (disc. of Williams).

30. Fish, E. W.: D. Rec., 48:289, 1928.

31. Rosebury, Theodor, and Gies, W. J.: J. D. Res., 9:299 (June) 1929.

32. Chase, S. W.: J. D. Res., 9:288 (June) 1929.

33. Karshan, Maxwell: J. D. Res., 10:181 (April) 1930.

34. Gysi, Alfred: D. Digest, 37:661 (Oct.) 1931.

35. Bibby, B. G.: J. D. Res., 12:99 (Feb.) 1932.

36. Williams, J. L.: J. D. Res., 5:117 (Sept.) 1923.

37. Bödecker, C. F.: D. Cosmos, 69:987 (Oct.) 1927.

Hanke[9] and can be observed in a great many published illustrations of dental caries.

My observations[35] have indicated further the persistence of the enamel rod sheaths during periods of tooth destruction. I found, as had Bödecker,[37] that the destruction of the inorganic part of the enamel precedes that of the organic. Under certain conditions, and possibly aided by a toughening process comparable to the tanning of leather, these rod sheaths remain intact. After a time, perhaps owing to a lack of bacterial nutriment, the destructive process ceases and the spaces between these organic structures become filled with some acid-resistant material. When this takes place in adjacent enamel rods, the rod sheaths can be seen running through the area (Fig. 4). This appearance, although not remarked elsewhere, can be observed frequently in histologic sections or published illustrations (Fig. 3). The origin of the acid-resistant material observed by Beust,[38] Malleson[18] and Enright, Friesell and Trescher[39] in the dental enamel is probably similar. These observations of changes at the surface and in the enamel substance are important because they offer an explanation for the noncarious surface alterations described above and also for the so-called slow caries and arrested caries in enamel. Their principal value lies in the demon-

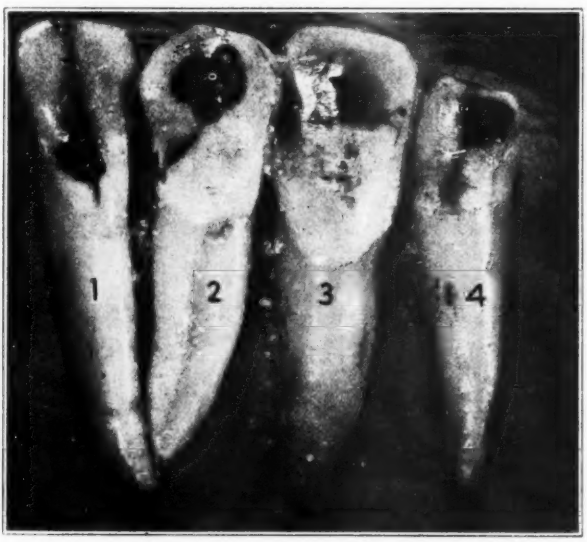

Fig. 5.—Extracted teeth showing areas of enamel decalcification stained black with 5 per cent silver nitrate. The decalcification was brought about by the action of fermentation products of leptotrichia (*1*), lactobacilli (*2*), fusobacteria (*3*) and gram-negative cocci (*4*) acting through "windows" in a shellac covering. (×3.)

38. Beust, T. B.: Micro-Organisms and Caries, J.A.D.A., 17:1536 (Aug.) 1930.

39. Enright, J. J.: Friesell, H. E., and Trescher, M. O.: J. D. Res., 12:759 (Aug.) 1932.

stration that changes other than caries occur in the enamel.

SIGNIFICANCE OF FILMS AND PLAQUES

A microscopic examination of the enamel surface by reflected light shows that it is not smooth but extremely rough and composed of pits and hollows. This has been pointed out by Pickerill,[1] Plotz[40] and Hanke.[9] Obviously, then, the usual cleansing processes can only polish the elevations, while the depressions retain their original covering. In other words, there is but a remote possibility of removing all of the deposits from the accessible areas of the enamel surface; whereas, on the inaccessible parts, they will always remain practically undisturbed. Since caries is supposed to be caused by the presence of undisturbed deposits on the tooth surfaces, a study of their intimate nature is essential.

In order to avoid unnecessary confusion, a differentiation is made here between dental films and plaques. The former term is reserved for the thin, viscous fluid layers which cover the surfaces of all teeth; the latter term is used only for fixed deposits of various types. Neither would include deposits of food or *materia alba.*

Films.—The significance of films, in the limited sense, has not been considered. It is believed that they originate principally from the saliva. Since their nature depends largely on the mucin content, they may be influenced by variations in the secretions of the buccal as well as of the salivary glands. Fluid films of this type exert considerable surface tension force and, no doubt, serve to prevent accumulation of bacteria and foreign material.

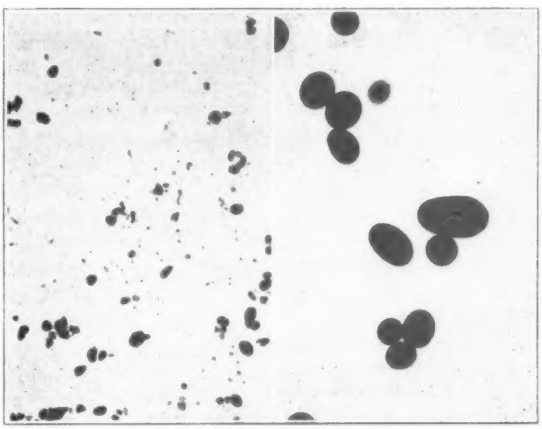

Fig. 6.—Granules of wheat and potato starch; showing greater size and regularity of the latter (stained with iodine). (×100.)

Plaques.—Concerning the nature of plaques and their cause, there are two schools of thought. The one, championed

40. Plotz, Richard: Ztschr. f. Stomatol., 29: 1201 (Oct.) 1931.

by Kirk,[41] suggests that mucin is of fundamental importance; the other, supported by a greater number of workers,[42] stresses the prominent rôle of bacteria. Recent investigations[43] support the latter view, and my observations[20] have revealed that appreciable quantities of mucin are not present in plaques from which the surface film has been removed by washing.

It has been generally assumed that it is desirable to remove plaques from the teeth, and although this must be admitted from an esthetic point of view, there is no proof of its value in dental prophylaxis. Since perfect teeth are frequently found in the dirtiest mouths, and since the complete removal of plaques is impossible, one may raise a question as to the possible harmfulness of too rigorous prophylactic measures. A better understanding of the significance of plaques can be obtained by recognizing different types and appreciating that the presence of some accumulations about the teeth may result in damage, while others may give an added measure of protection. In support of this approach, it may be pointed out that the green plaques on children's teeth are sometimes associated with decalcification; whereas, those calcified forms which are called calculus are associated with sound teeth. I[44] was able to demonstrate that teeth which show characteristic brown plaques have only about one-half as much decay as those which lack them, a finding which agrees with the observations of Pickerill,[1] Jones,[45] Hewat[46] and Dobbs.[47]

Investigations of the composition of plaques are rare, but our own observations[48] of brown plaques and plaque-bearing membranes from the surfaces of old sound teeth have revealed something of their structure. Examination of smears from both of these has revealed a predominance of thread-forming bacteria. Studies of prepared sections from the latter have added the further information that these membranes consist essentially of gram-positive filaments and gram-negative cocci, the former in the deeper part making up a layer of elements arranged at right angles to the enamel surface, and the cocci distributed somewhat irregularly in the outer part. A similar predominance of filamentous organisms in plaques was observed as early as 1847 by Ficinus[22] and by Leber and Rottenstein[22] in 1867. Miller[23] showed the same arrangement of filaments in his illustrations and referred to it as Wedl's "matrix of *Leptothrix buccalis.*" Hopewell-Smith[49] found that thread and rod bacteria crowded and sometimes obscured the enamel cuticle, and the illustrations in Williams,[28] Pickerill's[1] and Kronfeld's[50] works have shown a similar arrangement of elements.

We[51] have succeeded in cultivating, from the tooth surfaces, anaerobic bacteria which show the peculiar structure and staining reactions of the filamentous

41. Kirk, E. C.: D. Cosmos, 52:729 (July) 1910.

42. Footnotes 1, 3, 23. Goadby, K. W.: Mycology of Mouth, London: Longmans Green & Co., 1903, p. 133. Williams, J. L.: D. Cosmos, 41:317 (April) 1899.

43. Chase, S. W.: D. Cosmos, Anat. Rec., 33:357, 1926.

44. Bibby, B. G.: J. D. Res., 11:855 (Dec.) 1931.

45. Jones, W. H.: Brit. D. J., 54:657 (June 15) 1933.

46. Hewat, R. E. T.: New Zealand D. J., 28:3 (Sept.) 1932.

47. Dobbs, E. C.: Personal communication to the author.

48. Footnotes 20, 44.

49. Hopewell-Smith, Arthur: Dental Microscopy, Philadelphia: S. S. White Dental Mfg. Co., 1899, p. 163.

50. Kronfeld, Rudolph: Histopathology of Teeth, Philadelphia: Lea & Febiger, 1933.

51. Bibby, B. G., and Knighton, H. T., to be published.

elements seen in plaques. These organisms were shown to be leptotrichia and are sufficiently characteristic to justify the assumption that the cultivated forms are identical with those seen during the examination of the membranes from the enamel. Since leptotrichia are capable of producing a high acidity in mediums containing carbohydrates, there is no reason for believing that of themselves they would act as a defense to the tooth. Indeed, the presence of accumulations of these organisms on sound teeth suggests that the initiation of caries must depend on conditions other than the presence of acid-producing organisms.

It appears, then, that bacterial plaques on the enamel surfaces of the teeth may be associated with immunity to caries or with an increased liability to the disease, and that the significance of any accretion depends on its own properties and the nature of its environment. It is possible that the normal mouth favors a particular type of plaque, and that departures from this type result from variations in the nature of the oral secretions or of the food accumulations about the teeth.

RÔLE OF BACTERIA IN CARIES

Since it has been shown that bacteria are constantly in intimate contact with the enamel, it is essential to consider their relationship to the processes of tooth destruction. To begin this discussion, it may be pointed out that there are four reasons for believing that the presence of micro-organisms is not necessarily associated with active caries: (1) the process of decalcification may be self-limiting; (2) the bacterial types on the enamel may not be capable of forming an acidity sufficiently high to decalcify the enamel; (3) if acid is formed, it may be catabolized to nonacid end-products before it gains access to the enamel surface, and (4) no carbohydrate may be available from which the organisms can produce acid. Another point to be borne in mind is the fact that it has been shown[52] that two types of bacteria in association with each other are often capable of producing effects which neither can produce alone, and that the metabolites of one organism may be acted on by another to give origin to new end-products. Such associations and synergistic effects are fairly common in nature, and although they cannot be demonstrated as yet on the tooth, the possibility that they play a rôle must not be forgotten.

Enright with his associates[40] has shown that an acidity as low as p_H 5.0 is required before enamel will be decalcified readily in saliva. Furthermore, they have categorically stated that the lactobacilli are the only organisms in the mouth capable of producing this degree of acidity. Hence, the claim that decalcification of enamel in the mouth must result from the action of these organisms. It is quite true that by the highly selective cultural methods used, the only organism cultivated from the mouth which fulfilled this requirement was *Lactobacillus acidophilus*. This fact does not prove that other organisms were not present or that other aciduric bacteria might not have been grown, if methods more favorable to them had been employed. It may be pointed out that pneumococci can produce a p_H as low as 5.1[53] and streptococci a p_H as low as 4.5.[54] In this connection, it is interesting that

52. Holman, W. L., and Meekison, D. M.: J. Infec. Dis., 29:145 (Aug.) 1926.

53. Lord, F. T., and Nye, R. N.: J. Exper. Med., 35:687 (May) 1922.

54. Fennel, E., and Fisher, M. B.: J. Infec. Dis., 25:451 (Dec.) 1919. Topley, W. W. C., and Wilson, G. S.: Principles of Bacteriology and Immunity, New York: William Wood & Co., 1931, p. 377.

Clarke[55] and Maclean[56] found that streptococci initiated the decalcification of enamel in natural caries. We have been able, moreover, to isolate four aciduric organisms, two leptotrichiae, a fusobacterium and a gram-negative coccus, which produce in Douglas broth containing ascitic fluid and 2 per cent glucose or maltose a p_H of 5.0, 4.9 and 5.0, respectively. These strains appear to be inhabitants of all mouths and with them it has been possible to produce decalcification of enamel. (Fig. 5.)

In view of these findings, it is necessary to question the theory of the specificity of *L. acidophilus* as the cause of dental caries. That a close correlation has been established[57] between the occurrence of lactobacilli in the mouth and the presence of dental caries cannot be doubted, although some observers[58] would question the validity of this statement, and others[59] point out that the organisms may appear or proliferate as the result of the formation of cavities. Certainly, the predominance of lactobacilli in carious cavities does not prove *per se* that these organisms produced the cavities, but only that conditions in them favor their growth.

Severe criticism of the theory of a specific bacterial cause for caries may be directed at its proponents for failing to study the process in its initial stages and for making little or no effort to discover bacterial causes other than the presence of *L. acidophilus*. If highly selective mediums were available for the other mouth organisms mentioned above, it is probable that interesting correlations could be obtained between their presence and the occurrence of caries. In fact, the findings of Howe and Hatch,[60] Kligler[61] and Jay[62] indicate to my mind that organisms of one or the other of these types appear in dental caries. The constant presence of aciduric organisms, such as leptotrichia and gram-negative cocci, on the enamel surface is an important fact, suggesting that the bacterial equipment for the initiation of caries is always on the tooth, and that another factor, such as the presence of some carbohydrate, is the variable which determines the onset of decay.

Before bacteria are capable of producing acid from carbohydrates, it is necessary that the latter be present in a form which can be broken down by bacterial activity. This fact does not seem to have been appreciated; for there are no observations to show that any of the bacteria in the mouth can attack starches directly or break them down to acids. Thus, the finding of amylolytic bacteria in the mouth would be of considerable interest. The presence in the saliva of an amylolytic enzyme, ptyalin, which produces maltose and dextrin from starches and thus completes the first step toward the production of acid lessens the importance of the absence of starch-splitting bacteria. At present, therefore, the important bacterial fermentations concern maltose and dextrin. Since these carbohydrates can be utilized by most

55. Clarke, J. K.: Brit. J. Exper. Path., 5:141 (June) 1924.

56. MacLean, J. H.: Proc. Roy. Soc. Med., 20:34, 1927. (Sec. Odont.)

57. Footnote 40. Bunting, R. W., et al.: D. Cosmos, 70:1 (Jan.), 1002 (Oct.) 1928. Kligler, I. J.: J. Allied D. Soc., 10:141 (June), 282 (Sept.), 445 (Dec.) 1915.

58. Tucker, W. H.: J. Infec. Dis., 51:444 (Nov.-Dec.) 1932. Boyd, J. D.; Zentmire, Z., and Drain, C. L.: J. D. Res., 13:443 (Dec.) 1933.

59. Footnote 58, second reference. Thompson, R.: Proc. Soc. Exper. Biol. & Med., 29: 103 (Oct.) 1931.

60. Howe, P. R., and Hatch, R. E.: J. M. Res., 26:481, 1917.

61. Footnote 57, third reference (Kligler).

62. Jay, Philip: J. Bacteriol., 14:385 (Dec.) 1927.

bacteria, acid formation from them is rapid. Hence, it is only where large accumulations of carbohydrate are shielded from the diluting power of saliva that a sufficiently high p_H develops to favor aciduric micro-organisms at the expense of other bacteria. In a sense, therefore, the rapid utilization of carbohydrates by other than aciduric organisms may be regarded as a beneficial process. It is plain that the significance of bacteria in dental caries cannot be estimated until more is understood about interacting bacterial processes in the mouth, knowledge which can come only from extended studies of the bacteriology of the normal mouth.

EFFECTS OF SALIVA ON TOOTH DECAY

The amylolytic action of saliva, the first step in the change of carbohydrates to acids, has been mentioned. This effect was demonstrated in the following way: To 15 c.c. amounts of nutrient broth were added 2 c.c. of freshly filtered saliva and 2 c.c. of autoclaved starch mixtures, prepared by boiling corn, wheat or potato starch for ten minutes in twenty times their volume of water. Control tubes were set up without saliva. All of the tubes were inoculated with 0.1 c.c. amounts of an 18-hour broth culture of *L. acidophilus* and incubated at 37.5 C. After twenty-four hours, the hydrogen-ion concentration of all the mixtures was determined colorimetrically. The following were the results: corn starch with saliva, p_H 6.9; without saliva, p_H 7.0; wheat starch with saliva, p_H 5.1; without saliva, p_H 6.3; potato starch with saliva, p_H 5.0; without saliva, p_H 6.2.

These results show a definite increase in acidity in the tubes which contained saliva.

The experiment just described indicates that ptyalin may be important in the process of dental caries. This possibility was not supported by the clinical investigations of Hubbell,[63] but was indicated by the results obtained by Adams and Myers,[64] who found an association between a high amylolytic power of the saliva and susceptibility to caries. Pickerill[1] and Day[65] have shown a reverse relationship. It is possible that the absence of ptyalin in the saliva of some animals may contribute in part to their immunity to dental decay. Under such circumstances, the formation of acid would have to depend either on the amylolytic action of bacteria or on the presence of fermentable sugars or amylases in the food.

In addition to the possibly harmful property of saliva, other as yet unproven effects may exist. A detailed consideration of these is not within the scope of this review, but some of them may be listed. 1. Saliva may serve as a cleansing agent which prevents food from accumulating,[1] or, by more complex processes[42] determine the ability of certain substances to form plaques. 2. Saliva may neutralize acids as fast as they are formed, and, as a result of this buffering property, prevent decalcification of the teeth. 3. Saliva may prevent the growth of certain bacterial types; indeed, the inhibition of aciduric organisms has been suggested[66] as a factor in determining the occurrence of caries. 4. Saliva may favor the growth of particular bacterial species, thus tending to establish a fixed flora in the mouth which may or may not be potentially acid-producing.

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63. Hubbell, R. B.: Am. J. Physiol., 105: 436 (Aug.) 1933.

64. Adams, W. L., and Myers, V. C.: J. D. Res., 13:311 (Aug.) 1933.

65. Day, C. D. M.: D. Cosmos, 76:683 (June) 1934.

66. Lennox, Joseph: So. Afr. D. J., reprinted Austral. D. J., 4:867 (Sept.) 1932.

It has been suggested[67] that the diet is chiefly responsible for bringing about the first three of these possible effects attributable to the saliva. The evidence is not convincing, and it is certain that a real understanding must wait until more has been added to our knowledge of both the biochemistry of saliva and the physiology of bacteria.

INFLUENCE OF FOOD IN ALTERING THE ENVIRONMENT OF THE TEETH

Although all students agree on the existence of a definite correlation between diet and the incidence of caries, a sharp line of division appears between the nutritional and local theories, when an attempt is made to explain the relationship. The former group does not believe that the presence of carbohydrates in the diet offers an adequate explanation and have postulated, accordingly, theories which suggest that dietary deficiencies lead to alterations in the composition of the teeth and the saliva, which, in turn, produce dental decay. A full discussion of these views cannot be attempted at this time; but it may be stated that significant changes in the tooth enamel or saliva due to diet have yet to be demonstrated, and that the evidence supporting the claims of the nutritional school is unconvincing. This becomes obvious when it is appreciated that many frequently unrecognized local conditions influence the results of both natural and experimental diets. Some of these local influences will be discussed in the following paragraphs.

The changes which can be brought about in the bacterial flora of the intestine by altering the diet suggest that like changes might possibly be effected by similar means in the mouth, but as yet few observations indicate that this is so. Pickerill and Champtaloup[68] observed differences between smears from the mouths of children on "native" and those from the mouths of children on "civilized" diets. Howitt, Fleming and Simonton[69] found no change in the flora of patients on different diets, other than an increase in the aciduric forms when the carbohydrate was increased. Bunting[70] also found an increase in aciduric bacilli in children on a high carbohydrate diet. Tucker[71] and Boyd, Zentmire and Drain,[72] on the other hand, found no differences between the oral flora of children on special and those of children on ordinary diets. It is probable that the mouth flora are less profoundly affected by diet than those of the intestine because gross accumulations of food are in contact with the teeth for only limited periods of time, while, in the intestine, contact is more prolonged. This hypothesis finds support in the fact that those sugars which are rapidly absorbed from the intestine are less effective in bringing about bacterial changes there than are the less absorbable carbohydrates which remain in the lumen of the gut for longer periods. The shortcomings of investigations of change in the oral flora reside in the fact that these studies have not been directed toward the fissures and irregularities of the tooth surfaces, where persistent food accumulations might be found, and, until this has been done, a valid knowledge of the effect of diet on the surface plaques and the immediate environment of the

67. Footnote 1. Broderick, F. W.: Dental Medicine, St. Louis: C. V. Mosby Co., 1928. Hawkins, H. F.: Dental Decay—What It Is and Means for Its Control, J.A.D.A., 16:781 (May) 1929. Klein, Henry, and McCollum, E. V.: J. D. Res., 12:524 (June) 1932.

68. Pickerill, H. P., and Champtaloup, S. T.: Brit. M. J., 1913, p. 1482.

69. Howitt, B. F.; Fleming, W. C., and Simonton, F. V.: D. Cosmos, 70:475 (June) 1928.

70. Footnote 57, second reference.

71. Footnote 58, first reference.

72. Footnote 58, second reference.

teeth will be lacking. It may be noted further that the ability of foodstuffs to form deposits on the teeth is probably important in influencing the bacterial flora.

Since the bacterial action on proteins produces an alkaline reaction, it is the carbohydrates alone which need be considered in the production of acids capable of decalcifying the teeth. The acids formed in the depth of a food deposit are obviously more important than those produced from soluble sugars in solution in the saliva, since the latter are neutralized as soon as formed. The problem, therefore, resolves itself into a consideration of the readiness with which starches can be broken down to acids, either directly by bacteria or through the intermediate steps of the ptyalin products, dextrin and maltose.

The ability of bacteria to break down starches has not received much attention, and information is lacking regarding the existence in the mouth of bacterial types with amylolytic properties. Regarding the susceptibility of starches to the action of ptyalin, the state of knowledge is little better. The hydrolysis of raw starches proceeds slowly; hence, starch in this form would have to remain in the mouth for a considerable period before being significantly changed. The more rapid hydrolysis of cooked starches has been studied by O'Sullivan[73] and Sherman, Walker and Caldwell.[74] The former worker found that ptyalin hydrolyzed cereal starches more rapidly than potato starches, but the latter group in more careful experiments obtained opposite results. The substrates used by the former were more closely comparable to those likely to be deposited in the mouth than were the purified materials employed by the latter. Pickerill[1] and Read[75] seem to be the only investigators who have compared the production of acids from various prepared foods, but since these observations were limited to the consideration of a few wheat products, their results lack general significance. The demonstration that finely ground flours are more rapidly broken down to acids than coarser preparations is significant, for it suggests the possibility that the particle size of natural starches might influence the readiness with which they could be broken down to acids.

In addition to the effects that they may exert on the bacteria in intimate contact with the teeth, food accumulations in the mouth are themselves important in forming acids. Conditions influencing the amount and nature of these deposits, therefore, are worthy of study and will be considered. The presence in the food of gluten has been claimed to be important in this respect.[76] On account of its solubility, its property of forming adhesive mixtures with other foods and its natural association with carbohydrates, this protein has been supposed to be the principal factor in the deposition of acid-forming substances on the teeth. The fact that protein is present in significant amount only in wheat starches[77] is suggestive of a direct relationship between the adhesiveness of white flour products and the high incidence of caries in races which use wheat flour as the basis of their diet.

Wallace[78] and Pickerill[1] stressed the

73. O'Sullivan, J.: J. Chem. Soc., 85:616, 1904.

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INCIDENCE OF CARIES IN GROUPS ON DIFFERENT DIETS

Group	Source of Carbohydrate	Caries Incidence Per Cent	Dietary Deficiency	Conditions Influencing Food Accumulation
South Africa[1]				
Children living at home		99.30	Not known	Frequent eating
Children living in orphanages		55.80	Not known	Infrequent eating
Children living in towns[2] (Northern Transvaal)	Refined wheat	92.44	Not known	Frequent eating[18] of refined food
Children living in native state[3]	Unrefined grains	74.10	Not known	Infrequent eating[18] of coarse food
England				
50,000 school children[4]	Reduced in amount	Reduction of 51–95	Vitamins A,C & D (?)[18]	Absence of sugars
Children in war years[5]	Reduced in amount	Marked reduction	Vitamins A,C & D	Less frequent eating
United States				
Children[6]		79.20	Vitamin C (?)	
Children		34.60		Drinking of much fruit juice with meals[18]
China				
Mixed group of 4,474[7]	Rice	7.60	Vitamins A,C & D (?)[4] Alkaline ash[4]	Infrequent eating
Mongolian group of 25[8]	Rice	0.00	Alkaline ash[4]	Infrequent eating
Student group[8]	More varied	43.40		
Unspecified group[9]	Rice, taro, sweet potato[15]	2.50[4]	Vitamins A,C & D (?)[18]	Infrequent eating[15]
Tristan da Cunha[10]	Potato	Extremely low	Vitamin C (?)[18]	Infrequent eating; simple meals; no refined carbohydrates
Pitcairn Island[11]		Very high	Raw milk	
Island of Lewis[12]	Oatmeal	Very low	Calcium phosphorus Vitamin C (?)[18]	
Honolulu				
Children, mixed races[13]	Wheat flour	Very high	Alkaline ash	Nature of carbohydrate[15]
Children, mixed races	Potato flour	Low		Nature of carbohydrate
Japanese children[14]	Excess of sugar	100.00		Continuous eating

Children, mixed races[13]	Wheat flour	Very high	Alkaline ash	Nature of carbohydrate[13]
Children, mixed races	Potato flour	Low		Nature of carbohydrate
Japanese children[14]	Excess of sugar	100.00		Continuous eating
New Zealand				
British population[15]	Wheat flour and sugar	97.00	Vitamin C (?)[18]	Much refined carbohydrate[18]; very frequent eating[18]
Civilized Maoris[15]	Wheat flour and sugar	95.00	Vitamin C (?)[18]	Frequent eating, with refined carbohydrates
Uncivilized Maoris[15]	Sweet potato	1.20	Vitamin C (?)	Infrequent eating, with no refined carbohydrates
Australia				
Aborigines[15]	Roots	4.30[9] 20.50	Vitamin C (?)[18]	Infrequent eating, with no refined carbohydrates
British population	Wheat flour and sugar	95.00	Vitamin C (?)	Frequent eating, with refined carbohydrates
Eskimos[16]	Nonhydrolyzable moss[17]	1.00	C[19]	Infrequent eating with no refined carbohydrates

1. Friel, G., and Shaw, J. M.: Brit. D. J., 52:309, 1931.
2. Brown, J. M.: So. Afr. M. Rec., Sept. 27, 1924 (quoted from Footnote 77 [text]).
3. Till, A. T.: So. Afr. D. J., 1:209, 1927 (quoted from Footnote 77 [text]).
4. Wheatley, J. (quoted from Footnote 6 [text]).
5. Wallace, J. S.: Footnote 5 (text).
6. Hanke, M. T.: Footnote 9 (text).
7. Montelius, G. A.: J. D. Res., 13:501 (Dec.) 1933.
8. Anderson, B. G.: J. D. Res., 12:709 (Oct.) 1932.
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15. Pickerill, H. P.: Footnote 1 (text).
16. Leigh, R. W.: D. Cosmos, 67:884 (Sept.) 1925.
17. Cowgill, G. R.: D. Cosmos, 76:223 (Feb.) 1934.
18. Interpretations not suggested by author quoted.
19. Stefansson, V. (quoted from Footnote 36 [text]).

rôle of the physical composition of the food in preventing accumulations about the teeth, calling the rough fibrous foods which had this property "detergent." Pickerill adduced experimental evidence to support this view, but apparently felt that the washing action of the saliva was of equal importance. The experiments of Howitt, Fleming and Simonton[69] failed to support these findings, but the weight of clinical evidence is in accord with the original premise.

A further explanation of the different adhesive tendencies of foods may be found in the properties of the different plant starches. These starches are alike in being composed of granules with a resistant outer layer,[79] but, according to their plant origin, they differ considerably in size, shape and tendency to rupture and gelatinization.[78] For instance, the granules of potato starch are oval and measure as much as 100μ in diameter, while those of wheat flour are irregular and less than 40μ. These differences, quite apart from the presence in wheat of gluten and fractured granules, could account for its greater adhesiveness. In addition to the fact that great adhesive forces occur with smaller particles, it has been shown[80] that, after gelatinization, such particles have a greater viscosity than large granules.

These physical differences may be of importance in determining the adhesion of food materials in surface irregularities where no gross deposits can be observed.

Another determinant of the presence of food about the teeth is the frequency of eating. This fact is obvious, but gains significance because it represents one of the greatest differences between the dietetic habits of the relatively caries-immune native races and the caries-ravaged civilized peoples.

In the accompanying table the possible relationship between the diet and the incidence of caries has been presented. A comparison of the diet of the groups enjoying relative immunity to caries and that of those who are susceptible does not reveal any striking differences. It is safe to say that, in the less susceptible group, the absence of certain types of carbohydrates and of conditions which contribute to food accumulations is as marked as the adequacy of the diets in respect to vitamin and mineral salts. The observations in New Zealand and Honolulu and among the Eskimos are particularly impressive in this respect.

79. Bodansky, M.; Introduction to Physical Chemistry, New York: John Wiley & Sons, 1930, p. 61.

80. Grüss, J.: Wchnschr. Brau., 49:387, 1932. Chem. Abstracts, 27:3846, 1933.

SUMMARY

The general belief that the resistance of a tooth to caries depends on the absence of formative defects lacks definite proof.

The nature of the pathologic processes occurring at the onset of caries is not understood.

The well-formed organic structures of the enamel are resistant to the enzymatic action of all oral bacteria.

Accumulation of bacteria on the tooth surface may act as a means of defense, thus being beneficial rather than harmful.

Many types of bacteria may initiate the process of tooth decalcification, although *Lactobacillus acidophilus* usually predominates in the later stages.

The bacterial processes in the mouth concerned in the formation of acids from carbohydrates have not been fully investigated.

The ptyalin of the saliva may play an important part in the production of acids on the teeth.

The effect of the food in changing the immediate bacterial environment of the teeth is not known.

The formation of food deposits on the teeth may be influenced by the nature of the carbohydrate foods eaten and the frequency of eating.

The rôle of saliva in keeping the teeth free from food accumulations is important.

As long as so many contributing factors in the origin of dental caries remain unexplained, there is no reason to doubt that the local theory will ultimately offer an adequate explanation of this disease.

EXODONTIA RELEVANT TO THE GENERAL PRACTITIONER*

By A. P. WILLIAMS, D.D.S., Louisville, Ky.

SINCE time began and human beings were created, the story of man's achievement has never failed to fascinate. Generations have come and gone, but there constantly arise others to take up the threads of history and weave the past and the present into one continuous event. We are a composite of all who have preceded us, and whatever part of our modern civilization we may analyze, there is a great source of satisfaction in knowing that constantly progress is being made and today we can look with a justifiable pride on the progress of dentistry. I shall attempt to give you a bit of the past and present of the practice of exodontia.

There is no record as to when and where the extraction of teeth may have begun, but it is natural to assume that diseases of the teeth and the involvement of their contiguous parts had their origin with the beginning of the human race.

Even in the days of Hippocrates, we assume, civilization was having a marked influence on the teeth of the people, and it appears that throughout the past 2,000 years, our teeth have been undergoing evolution.

Today, man, the ape and the old world monkey have thirty-two teeth, eight on each side of each jaw; yet man's mammalian ancestor had forty-four teeth: three incisors, one cuspid, three bicuspids and four molars on each side of the jaw. Today, variation rules. Often there is only one incisor, an inherited condition, though there may be three. The cuspid is rarely absent; while a third bicuspid is occasionally present. A fourth molar is rarely present, but is frequent enough to be suggestive of prehistoric man. The third molar is the bad lot among us today, for owing to the evolution of man, the jaws are too short, and it presents at various angles, varies in its cusps and roots, frequently is a mere stump and often never erupts at all.

While I am on the general subject of teeth, let me digress for a moment to say that there are two places in the world today, namely, certain islands in the South Seas and a section of the Himalayan Mountains, where decay of the teeth is unknown. The late George Dorsey stated that, in hundreds of skulls collected

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in New Guinea, there was not one imperfect set: they were all strong, sound and beautifully alined.

In the process of evolution, it is interesting to know that the main business of the face is to hold the teeth-bearing jaws. The infant's face seems small because the brain is so large, real growth of the face beginning with the eruption of the teeth, the skull being a fulcrum for the jaw muscles in chewing. The muscles hold the fulcrum steady and develop with the teeth; and with the latter all in place, the round baby face disappears and strong jaws, powerful muscles, prominences and ridges in the bones of the face and head develop to support the muscles of mastication.

History reveals that there was little progress made in dentistry before the eighteenth century, the time of Pierre Fauchard, and, even then, legitimate dentistry was on a very low level. The so-called tooth-drawers were itinerant, moving from village to village, and socially considered as low as the tramping gypsies, and ofttimes compared with beggars, owing to the fact that they used their roaring voices as their chief means of advertisement. Even in this day, there are many villages in European countries where the blacksmith and the barber still function in the removal of teeth.

Up to the present century, no scientific term had been evolved to designate the science of extraction of teeth. The word "exodontia" was originated in 1913, by George B. Winter of St. Louis, and used by him as a title for his book published at that time. It was Dr. Winter's idea to give the profession a word that would raise the standard and character of the science of the extraction of teeth, and thereby eliminate the various promiscuous terms pertaining to this particular phase of dentistry.

As it is my desire to be as specific as possible in the presentation of the stages of exodontia, I have divided my remarks under three headings: preoperative, operative and postoperative considerations.

The preoperative consideration must of necessity include some of the indications and contraindications for extraction, but in this I shall touch only the high spots.

There are three factors that are worthy of consideration in the preoperative stages of an extraction: (1) age; (2) mechanical resistance; (3) pathology.

1. The age of the patient has a definite significance. We know that the younger the individual, the less density we encounter in the osseous structure and, as a consequence, definite tooth movement can be accomplished with the minimum amount of applied force.

2. Mechanical resistance is dependent on the structure of the tooth and its supporting osseous tissue.

3. Pathology is a consideration, for the amount of bone structure involved is an index to the amount of applied force necessary in tooth removal.

Under pathology, I desire to cite what is considered fundamental as related to the general removal of teeth.

Vincent's infection, phagedenic gingivitis, or trench mouth as it is commonly called, should not be overlooked in preoperative examination, for where lesions are present about the teeth, gums, buccal mucosa, floor of the mouth, tongue or lips, operative measures should be delayed until the infectious process has been checked.

With the tuberculous patient, extreme care should be given in the removal of infected teeth, and it is necessary that only a few be extracted at a time, as the procedure is often of serious consequence and may presage a tuberculous necrosis.

With the diabetic, the paramount consideration should be the choice of an anes-

thetic. A local is contraindicated, for, in a person having blood sugar, wounds do not heal readily; and as a local anesthetic inhibits circulatory function, its use is contraindicated. Diabetes is usually accompanied by pyorrhea. With the patient manifesting anemia, all focal infection should be eliminated.

I have specifically directed attention to the foregoing conditions of disease, namely, tuberculosis, diabetes and anemia, because the general practitioner is ofttimes called on to extract teeth for patients having these diseases. Tuberculous and diabetic patients are usually under medical supervision and, as a rule, acquaint you with the fact; while many patients with anemic conditions, which are ofttimes apparent, are not under medical care, and you in your professional capacity can be of great assistance in advising or insisting that they seek the service of a physician and secure a blood analysis. In the patient having a partially erupted third molar with an inflammatory process in evidence, with or without pus, surgical interference with the flap or overhanging gum tissue is most emphatically contraindicated. The actual cautery may be resorted to, or medication of the area, using acriviolet, mercurochrome and a 5 per cent arsphenamine in glucose solution. Acriviolet is a combination of aniline dyes, namely, gentian violet and acriflavine. Its action is bacteriostatic rather than bacteriocidal. It is an antiseptic with selective toxicity for gram-positive bacteria, especially the staphylococci and *Bacillus pyocyaneus*.

Mercurochrome is an efficient surface antiseptic having advantages over iodine in not precipitating protein. Its effects are probably not the result of any direct germicidal action, but of some indirect stimulation of the body defenses, such as occurs after the use of foreign protein substances. Arsphenamine may be considered as a specific to combat Vincent's spirillum.

The extraction of the third molar in a patient presenting an acute pericoronal inflammatory process is absolutely contraindicated. Operation, at this time, forces one to anticipate a spread of the infection that may be followed by cellulitis and possibly a blood stream infection. Proper treatment of an acute condition of this kind should be conservative, consisting of premedication and drainage by inserting an iodoform wick under the soft tissue, changing it daily until the soft tissues have regained their normal tone.

Unquestionably, the factors in the disastrous sequelae of the removal of lower third molars are lack of judgment as to when to operate and unwarranted traumatization of the tissues during operative procedure. Disease of the soft tissues is routinely seen in dental practice, but we must bear in mind that the peculiar danger to the bony framework of the body is injury, not disease. Trauma to the soft tissues and injury to bone at one and the same time are prognostic of periostitis and serious ostempyesis.

More postoperative difficulty attends the removal of the lower third molar than practically all other operative procedures within the mouth.

Infected teeth in the bicuspid and molar regions of the upper jaw should always be considered in connection with maxillary sinusitis owing to their close anatomic relationship, and at this point I must refer to pulpless teeth. I appreciate that this type of tooth is in controversial territory, but unquestionably all pulpless teeth which are in close proximity to the maxillary sinus should be removed regardless of roentgenographic findings, also all teeth in this area with deep pyorrhea pockets.

Before operating, extreme care should always be taken to pack the mouth with

gauze, to prevent foreign material entering the throat and to avoid ingress of saliva into the sockets.

It is a known fact that lack of surgical cleanliness in operations in the mouth does not in all cases result as disastrously as operative procedure in other parts of the body. Nevertheless, the inexorable fact still remains that inadequate surgical asepsis has serious sequelae, and we are remiss in our duty as professional men when we fail to carry out aseptic procedures which admit of no controversy. Therefore, allow me to say a word about instrument sterilization.

Solutions of various antiseptics or germicides have been applied to the sterilization of surgical or dental instruments and the so-called modern surgical procedure as introduced by Lister was an antiseptic procedure, dependent largely on the use of a more or less crude phenol. With the experience which has been since gained, chemical sterilization has been less and less used, and today instruments are sterilized by heat with or without water as a vehicle for the thermal energy.

All metal instruments, after use, should be thoroughly scrubbed in cold water and then immersed in slightly alkalinized boiling water and boiled continuously for a period of twenty minutes, after which they should be removed from the sterilizer and carefully dried with sterile towels. To maintain free and easy opening and closing of forceps, a lubricant of plain mercurial ointment occasionally applied to the joints will be found superior to any oil. There are dentists who say that aseptic measures are carried to extremes. Asepsis is by no means a controversial question, but there are many dentists who lack proper training in surgical operating room procedures, and I feel a deep sense of chagrin when I state the fact that there are many men in practice who do not own or use a sterilizer. The time is not far distant when the state boards of health will demand, and rightfully so, instrument sterilization. Unquestionably, a dentist's license should be revoked if he wantonly refuses to accept the fundamental concept of virulent bacteria. When he receives his license to practice, he automatically enlists in the army to battle against virulent micro-organisms, and he should be in line for a dishonorable discharge if he refuses to fight the enemy at the first line of attack by the use of the simple procedure of sterilization.

As a result of two modern miracles of applied science, namely anesthesia and roentgenography, the extraction of teeth becomes primarily a science of mechanical ingenuity, embracing the fundamental principles of leverage and laws of applied force.

The principal and most effective instruments for the extraction of normally erupted teeth are forceps, as they allow of better leverage and better adaptation to the tooth. The edges of the forceps should be sufficiently thin for insertion under the free gum margin, should be canted at an angle that is in line with the long axis of the tooth and should be sharp enough to cut the process when necessary. The beaks of the forceps should be applied in line with the long axis of the tooth, and any deviation from that angulation is to anticipate an unwarranted fracture. The handles should admit of proper adaptation to the hand to enable one to secure a firm grip, maintain steadiness and apply proper leverage. We should endeavor to dilate the alveolus and break the attachment of the roots from the alveolus before attempting the removal of the tooth from its socket.

In extraction movements, there is no need of haste. There are definitely

known movements for the removal of each and every tooth, and a proper technic calls for a definite application of applied force. Let us not become "fussed" and hasty in our operative procedure, but keep a cool demeanor. The patient's main concern is that the tooth be removed. Rapid operating, while spectacular, does not always have the best results. The careful operator is the one who respects the tissues on which he is working, as generally something has to be sacrificed for speed. In the event we are operating with a general anesthetic and are employing a proper technic, we have the patient under absolute control so that speed may be eliminated as a factor. Consequently, the rule is valid that there is no need for speed whether we are working in connection with a local or with a general anesthetic. Deep-seated roots should be removed by elevator technic, and in the event of failure to release them, the surgical flap method is indicated.

POSTOPERATIVE CONSIDERATIONS

The factors which enter into the final results as outlined by Fahy are: age, resistance, infection, bone spiculae, a fractured lingual plate, rough edges and foreign bodies in the socket and an exposed osseous structure.

1. *Age.*—We appreciate that the younger the person, the higher the rate of metabolism, and as a result, in the normal case, we anticipate a quick recovery.

2. *Resistance.*—Resisting power is high when leukocytes are present in sufficient numbers and are delivered through the blood stream to all the body cells. We have no way of measuring our resistance. To some bacteria, we are naturally immune; to others, naturally susceptible. The problem is to acquire immunity. While bacteriology may be classed as a comparatively new science, immunology is newer.

In the complicated process of the healing of wounds, there are many features which are difficult of explanation, for it is known that the process is the same in a clean wound as in a wound wherein bacteria are present; but in order for an infected wound to heal, the white cells of the blood stream must exert their phagocytic activities and engulf and destroy the bacteria.

3. *Infection.*—As the mouth always contains bacteria and the factor of infection is prominent as either a primary or secondary phenomenon in most of the conditions we are called on to meet, bacteria-inhibiting and bacteria-killing chemicals constitute an important part of dental materia medica. It will suffice to say that the present tendency is to avoid the use of strong or irritating chemicals or bacteriocides on living tissues. The rule is almost generally valid that any medicament which will injure the bacterial cell will do at least as much damage to the normal cell.

As early as 1917, Chappel recognized that most of the acute oral infections are of the pyogenic type, in which the polymorphonuclears largely participate in the defense, and he suggested that rational therapeutics should be content with a modest reinforcement or direction of natural procedure.

This tendency was hastened by the experience of the World War in which the chlorine group of drugs, such as Dakin's solution (surgical solution of chlorinated soda) and dichloramine T proved so effective, largely because the human tissues tolerate these substances well. Dichloramine T, when applied in oral infection, attracts large numbers of leukocytes, and the phagocytosis thereby facilitated probably plays some part in the beneficial results.

No one definitely understands the processes of the body in health and, even more certainly, no one can understand them in disease, unless he thinks in terms of the activities of individual cells or groups of cells.

Jordon says, "The less completely adapted the bacterium is to the host, the more virulent the disease." Hence, the really dangerous pathogenic bacteria as a rule do their damage in a short time. They are not adapted to live in their host. They kill.

We know that the constant fight in all disease is between the white cells and bacteria. If the cells win, we hear no more about it. If the bacteria win, we must do our best as therapeutists.

The remaining classifications according to Fahy; namely, bone spiculae, the fractured lingual plate, rough edges, foreign bodies in the socket and exposed osseous structures, I would consider under the care of the socket or sockets after extraction. These act as mechanical irritants, and as the primary factor of all disease is irritation, these irritating conditions must be recognized.

Rongeur forceps are essential to trim away bone septums and sharp edges, and all fractured pieces of process and loose fragments of bone should be removed, and the osseous tissue smoothed and covered with well-nourished soft tissue.

In extracting teeth carrying large fillings, we must make sure that no part of the tooth, bone or filling has fallen into the socket and remained there.

When it is necessary to operate in the presence of pus and complete evacuation of the pus has not been accomplished, drainage should be maintained by the use of iodoform gauze drains, the drain being allowed to remain for an interval of forty-eight hours. It is the concensus of opinion of men specializing in exodontia that a natural blood clot in a socket is, after extraction, most desirable, and should not be interfered with in any way. If there is not sufficient hemorrhage into the socket to bring about formation of a natural clot, gentle curetting should be the rule, to facilitate bleeding, to an extent that a clot may be established.

With the thumb and forefinger, the dilated alveolus is tightly compressed, to restore it to its normal position. The fingers must be kept out of the wound. Rubber gloves should be worn, or, if you prefer a modification, at least rubber finger stalls on the forefingers and thumbs; for it is absolutely impossible to keep the under portion of the finger nails free of bacteria, and it is positively inexcusable to break the link in an aseptic procedure by using bare fingers in the mouth of a patient during or after surgical interference.

As a summary in the care of the socket after extraction, allow me to repeat that "the peculiar danger to the bony frame work of the body is injury—not disease," and it is this fact that we must ever be cognizant of, and the fundamental premise upon which we must base care of the osseous structure.

Let us consider three more postoperative conditions: the dry socket, pain and hemorrhage.

One of the unpleasant postoperative sequences with which we have to contend is the so-called dry socket. It is an osteopathic condition over which the operator has little control in a preoperative way, for it is essentially an osteitis, due to atrophic changes in the peridental membrane. Factors that may be considered as causative are rarefying osteitis, which is usually due to pathologic processes resultant from pulpless teeth, or a condensing osteitis probably having as its background a disturbance of calcium metabo-

lism. Undue trauma to the osseous structure may be looked on as a predisposing condition, as is also the use of a local anesthetic that contains too much epinephrine. The presence of epinephrine in the anesthetic interferes with circulatory function and inhibits the flow of blood. Wounds that bleed freely rarely give trouble. Another predisposing condition is bacterial invasion through the saliva entering the socket before the blood clot has become organized. Last but not least, the blood clot is an ideal culture for the growth of any bacteria which may be present in the socket.

If there is an ostemia following extraction, it is best to advise the patient to apply an ice cap to the outside of the face, as cold applications have a tendency to constrict the arterial vessels, thereby aiding circulation within the congested clot. Ostalgia may be controlled by drugs. The barbituric acid group of drugs have somewhat supplanted the heavier opiates for the relief of pain as they usually produce a fairly natural sleep, which begins within an hour and lasts several hours, unaccompanied by depression of circulation or respiration. They are nevertheless not impotent as to deleterious effects as has been recently shown by the research of Kracke and his associates of Emory University, Atlanta. He has demonstrated that they cause agranulocytosis or malignant neutropenia. In a recent article Dr. Kracke[1] further states that "the clinical onset of many cases of granulopenia has been preceded by tooth extractions, treatment of pyorrhea, mouth ulcers, etc." His work has been further augmented by Arthur M. Hoffman, assistant clinical professor of medicine, E. M. Butt, assistant professor of pathology, of the University of California, and N. G. Hickey,[2] of Los Angeles. I earnestly recommend that you who are dispensing and prescribing drugs for the relief of pain, read these articles.

When the patient returns for postoperative examination and complains of a foul taste and odor, you may be assured that the clot is in a state of sepsis. Treatment now should consist of a gentle but thorough irrigation of the socket to an extent that all contents of the socket are removed. Then the socket is gently dried and a palliative dressing placed consisting of 5 per cent iodoform gauze, one quarter inch wide, saturated in oil of cloves, wintergreen and cassia, equal parts, to which have been added 175 grains of chlorbutanol to the ounce. This will give relief in less than thirty minutes. The dressing should be changed daily. Cotton is not used because the fibers cling to the walls of the socket and, as granulation starts, the fibers are apt to become enmeshed in the new tissue formation and disintegrate and become putrid. Therefore, gauze is used.

I still find many men using guaiacol and glycerine. I believe this combination of drugs is absolutely contraindicated, as glycerine dehydrates, drawing the moisture out of the osseous structure and thereby retards healing. Guaiacol will give no better results than the essential oils.

These sockets will not heal until all infectious material in the bone cells is evacuated, and it is impossible to establish a new blood clot in this type of socket until all infection has been eliminated and all painful symptoms have subsided. After granulation begins in the socket, a dressing of scarlet salve may be used, and I know of no other drug which stimulates

1. Kracke, R. R., and Parker, F.: Etiology of Granulopenia, J. Lab. & Clin. Med., 19: 799-818 (May) 1934.

2. Hoffman, A. M.; Butt, E. M., and Hickey, N. G.: Neutropenia Following Amidopyrine, J.A.M.A., 102:1213-1214 (April 14) 1934.

the growth of granulation tissue more quickly. Healing may now be facilitated by the very gentle use of a curet to stimulate bleeding and formation of a new clot.

Hemorrhage.—Postoperative hemorrhages are known to occur in some cases and are at times of great concern to the operator. They are classified as arterial, venous and capillary, and, according to the time they take place, as primary, immediately after extraction; intermediate, occurring within twenty-four hours after extraction, and secondary, occurring at times from four to ten days after extraction. Ordinary hemorrhages which occur after extractions are usually of the capillary primary type and can be controlled by using sterilized gauze packs and applying pressure on the packing by having the patient bite tightly and continually for a period of twenty minutes, and, in conjunction, applying an ice pack externally to the throat. If this does not control the hemorrhage, we must determine whether the bleeding is from the soft tissues or socket. If it is from the soft tissues, sutures will control it. If from the socket, all portions of the clot are removed from the socket, which is packed tightly, until it is completely filled with iodoform gauze, augmented by a pack for the patient to bite on, the packing being left in the socket forty-eight hours. The use of styptics or drugs locally is not resorted to. Pressure is fundamental and a fibrinogen is used for internal medication.

I find the most prevalent cause of postoperative trouble is failure on the part of the dentist to (1) isolate the field and prevent saliva from getting into the socket; (2) carry out an aseptic technic; (3) remove fragmented bone; (4) cover exposed bone with soft tissue and, last but not least, instruct the patient in the care of the wound. After the blood clot has become organized, it is best to leave it alone, but owing to the fact that manufacturers of mouth washes, through exaggerated advertising statements, have so thoroughly instilled in the consciousness of the laity the idea of antiseptics, the patients think they are facilitating healing by the use of this or that particular mouth wash, and in their overenthusiasm they often dislodge the clot by too vigorous rinsing and by continual sucking of the wound. Patients should be instructed to refrain from rinsing the mouth for at least two hours.

CONCLUSION

I have not presented any new or unique thoughts. We need to learn that none of us is wise enough to determine our actions by personal experience.

Glenn Frank has aptly said that all wisdom springs from experience, but it must be a triple experience; the experience of our ancestors; the experience of our contemporaries, and the experience of ourselves. We should pay tribute to those scientists who have accomplished work that will last for centuries and benefit endless millions of people. We, too, even though we are not endowed with genius, can do a goodly part toward alleviating the suffering of mankind, if we will acquire a knowledge of the fundamentals of our work in which have been tested the qualities of right and wrong, and the rules determined under which we are most likely to render the best service, and then put this knowledge into practice.

788 Starks Building.

CHEMICAL STUDY OF HUMAN SALIVA INDICATING THAT AMMONIA IS AN IMMUNIZING FACTOR IN DENTAL CARIES

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THE subject of dental caries has resolved itself into three component parts: the causative factor, the phenomenon that controls dental caries and the underlying metabolic forces that produce this control.

It is quite generally recognized that the cause of dental caries is the activity of acid-producing bacteria, held in close contact with the teeth by dental plaques. Recent findings have corroborated the work of the early investigators regarding the lactobacillus, which makes these views favorable for acceptance. This is especially true of Dr. Bunting's investigations.[1]

Up to the present time, the phenomena controlling dental caries have not been explained, although some progress has been made in the general direction of caries control through the various dietary régimes that have been prescribed, and apparently they are supported by scientific investigation. The work of Boyd and Drain and others shows that it is possible to control caries.

It may appear that the activities of the various investigators of this subject are working in opposite directions. One asserts that a lack of vitamin C is the important factor and another maintains that any well balanced diet will produce immunity. This seeming conflict is due, we believe, to the fact, that we have not realized what metabolic change is required in order to produce immunity. As a matter of fact, the same systemic changes are produced by the different methods employed, as we will show later in the discussion.

In the investigations that we have carried on relative to the chemical variation of the ingredients of the saliva of caries-immune and caries-susceptible individuals, the ammonia content of the saliva is the only striking difference we have found. Estimations were made of calcium, phosphorus, the p_H, titratable acidity, alkaline reserve and chlorine, which showed no significant variation in the immune and the susceptible. In caries-immune individuals, the ammonia content of the saliva is high. In susceptible individuals, it is decidedly and consistently lower.

The quantity of ammonia in the saliva has a decided effect on the physical character of the saliva, which, in turn, alters the conditions favorable for immunity or susceptibility. Ammonium salts are solvent of salivary mucin and dental plaques. They also alter the physical character of the saliva. If it is true that dental caries is caused by the action of acids produced by the *lactobacillus* held in close contact with the tooth surface by mucin plaques, it is obvious that when a substance which has ability to alter saliva in such a way as to retard plaque formation, as am-

1. Bunting, R. W.: Recognition of Bacillus Acidophilus Associated with Dental Caries, J.A.D.A., 17:2041 (Nov.) 1930.

monia does when present in the saliva in sufficient quantity, its significance in the study of dental caries is great.

Most accumulations upon the teeth are loosely referred to as mucin plaques regardless of the fact that it has been quite generally observed that plaques differ in their character and that all plaques are not favorable to the production of dental decay.

TABLE 1.—TYPICAL AMMONIA VALUES FOUND IN ANALYSIS OF CARIES-IMMUNE AND CARIES-SUSCEPTIBLE PERSONS*

Caries-Susceptible		Caries-Immune	
p_H	Ammonia Nitrogen Mg.	p_H	Ammonia Nitrogen Mg.
6.8	3.00	7.4	4.35
7.4	2.20	7.6	8.00
7.2	1.10	7.4	5.50
7.4	2.00	7.4	4.05
7.2	2.05	7.6	5.00
6.8	8.00	7.4	4.00
7.1	1.00	7.4	10.00
7.2	Nil	7.4	4.35
7.2	1.65	7.2	5.25
7.1	3.10	7.2	5.75
7.2	2.55	7.6	10.00
7.2	0.20	7.4	4.30
7.2	2.35	7.4	4.75
7.2	2.75	7.1	5.00
7.2	Nil	7.4	6.50
7.2	2.00	7.1	4.00
7.1	3.00	7.2	7.25
7.4	1.85	7.4	4.25
7.2	2.50	7.2	5.05

*The p_H is not indicative of either susceptibility or immunity. The average p_H of saliva from caries-susceptible persons is 7.2—, while the average p_H of the saliva of caries-immune persons is 7.3+. The average ammonia content of saliva in the caries-susceptible is 2.1 mg. per hundred cubic centimeters, while the average ammonia content of the saliva of caries-immune persons is 5.6 mg. per hundred cubic centimeters. The variation in ammonia between the two groups is decidedly significant.

It is not our intention to discuss the composition of the different types of plaques, but only to mention that the effect of the plaque is dependent on its character. Some plaques are permeable and some are impermeable, and it is the latter type that protects the acid-producing bacteria in the destruction of the tooth structure.

For years, dental investigators have felt that there must be some quality of the saliva that renders some individuals immune to dental decay, while, in other cases, caries runs rampant. It has also been observed that in the mouths of many immune individuals, the teeth are remarkably clean even where personal care is lacking and, in most susceptible persons, the teeth are most frequently coated with plaques, adherent food particles and sticky, stringy saliva.

The presence of ammonia in the saliva does have an effect on the quality of the saliva, as is illustrated in the following laboratory experiment. Ten cubic centimeters of saliva from a susceptible individual was placed in each of seven test tubes and to each tube was added 5 c.c. of different compounds of ammonia. The tubes were allowed to stand overnight. The accompanying photograph shows the effect of the various compounds on the saliva.

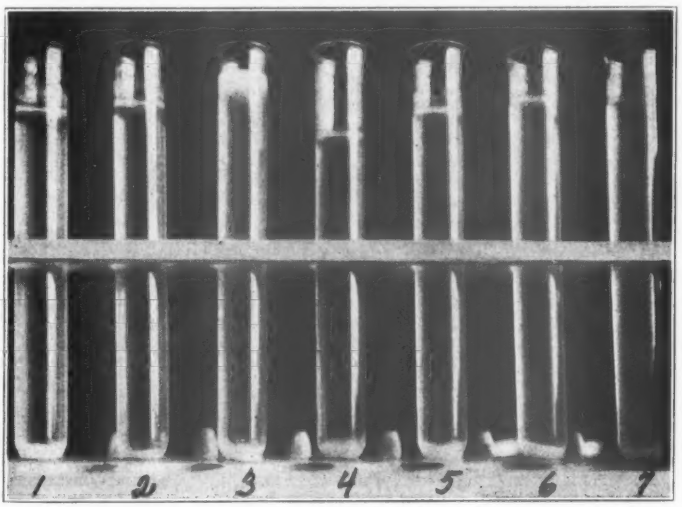
It is difficult to say definitely what amount of ammonia is necessary in the saliva to afford immunity, but, from our observations, caries does not exist if the ammonia content is above 5 mg. per hundred cubic centimeters of saliva. In the average individual, 4 mg. is probably sufficient. Table 1 shows the typical ammonia value for the saliva of caries-immune and caries-susceptible individuals.

Alkaline reserve estimations have shown no definite variation between the caries-immune or the caries-susceptible as shown in Table 2. We feel that the only

significance that can be placed on these analyses is the indication as to whether the compounds of the saliva are in an alkaline or an acid form. This is of interest because alkaline ammonium salts are more efficient in dissolving salivary mucin than are salts. Therefore, if the ammonium content of the saliva is slightly lower than what we call normal (4 to 5 mg.) and the alkaline reserve is high, we believe that the case could safely be classed as immune or at least considered to show a high degree of immunity. If the ammonia content was about normal and the alkaline reserve low, we would feel that the individual was susceptible. Alkaline reserve is an indication of immunity or susceptibility in these borderline cases and assists in the diagnosis.

As to the variability of the ammonia in the saliva, it cannot be regarded as a local condition of the saliva or of the mouth. It is a reflection of some deeper imbalance. The rate of production of ammonia from urea in any part of the body is dependent on the acid-base balance of the system, and, as will be shown, alteration of the acid-base balance of the body alters the ammonia and the urea content of the saliva.

Dietary regulation has long been considered as a possible and highly probable means of controlling dental caries. Convinced as we are that the salivary ammonia is the controlling factor in dental caries, we prescribed acid-producing and base-producing diets and observed the resulting variation in the ammonia content of the saliva. Alkaline diets raised the ammonia and acid diets produced a



Tubes containing the solutions with saliva: *1*, ammonium chloride; *2*, ammonium carbonate; *3*, ammonium phosphate; *4*, ammonium hydroxide; *5*, saliva with water; *6*, ammonium acetate; *7*, ammonium sulphate. Tube 4, containing ammonium hydroxide, is clear, with sediment sharply settled at the bottom. Tube 5, with the saliva and water, is opaque, with sediment clinging to the sides of the tube. Tube 2, containing ammonium carbonate, is nearly as clear as Tube 4, containing hydroxide.

decided drop in the salivary ammonia. It is known that in an aciduric condition, the kidneys produce large amounts of ammonia from urea, to neutralize the urinary acids and facilitate excretion. It is quite probable that, in caries, an acid condition is present and the available urea and ammonia of the body are constantly being used up, very little being left available for secretion into the saliva. Physiologists have not explained from what source the ammonia in the saliva is derived, but it seems obvious that it must be converted from the urea of the saliva.

Table 2.— Alkaline Reserve Estimations of Saliva*

Caries-Susceptible			Caries-Immune		
p_H	Ammonia Nitrogen Mg.	Alkaline Reserve C.c.	p_H	Ammonia Nitrogen Mg.	Alkaline Reserve C.c.
7.2	2.75	0.2	7.4	4.00	1.0
7.2	1.10	1.1	7.2	5.50	0.9
7.2	2.35	0.1	7.2	4.25	2.6
6.8	8.00	None	7.2	4.00	0.9
6.8	1.50	None	7.4	6.50	1.8
7.4	2.00	0.8	7.4	8.00	2.3
7.2	1.65	0.9	7.2	5.50	1.7

*Alkaline reserve is not indicative of either susceptibility or immunity.

As the blood carries only 0.07 mg. per hundred cubic centimeters, that source could not account for its presence in the saliva. When alkaline foods are consumed, necessity for ammonia in the kidneys is lessened and more is available for the saliva, a condition favorable to the control of caries resulting. At this point, let us consider the dietary control of caries as it is understood today. It has for years been observed that civilization has brought on itself the scourge of caries through the refinement of foods. The use of manufactured and refined foods increases the acid-producing factors in the diet in many instances, and, as we have stated, acid foods greatly lower the ammonia content of the saliva. Examination of the various diets suggested by many investigators in the control of caries reveals that they contain liberal amounts of alkaline ash foods.

Percy R. Howe has long reported beneficial results from the use of liberal amounts of citrus fruit in the diet. Citrus fruits are apparently the most efficient alkalinizer, and while credit for its control of caries has been given to its vitamin C content, we believe that it may be due to the resulting increase in salivary ammonia. We have succeeded in raising the salivary ammonia from 1 mg. to over 4 mg. in a month's time with the addition of orange juice to the diet. Jones, Larson and Pritchard have shown that natives of Hawaii who have acquired the civilized acid-producing diets have become very prone to caries; while those who have remained on the primitive alkaline diets have remained free from caries. In other

cases, we have raised salivary ammonia by the administration of sodium bicarbonate. The administration of acid-producing foods quickly lowers the ammonia in the saliva. It is very interesting to note that the very diets that have proved successful in the control of caries have a profound effect on the ammonia content of the saliva.

The purpose that ammonia serves in the saliva as the controlling factor is very definite. Repeating again that caries is due to the action of acid-producing bacteria held in close contact to the teeth by plaques, we have observed that ammonia has the power to dissolve salivary mucin and dental plaques. This power of ammonia to interfere with plaque formation, we believe, is the controlling factor in dental caries. Dr. Bunting has pointed out that, as a general rule, he finds *B. acidophilus* in abundance in caries-susceptible mouths, and that in mouths which are immune to dental caries, *B. acidophilus* is absent or at least greatly diminished. This brings up the possibility that ammonia in sufficient quantity in the saliva is inhibitory to the growth of *B. acidophilus*. We are investigating this at the present time and will report on it some time in the future.

To demonstrate the power of ammonia to dissolve salivary mucin and dental plaques, we precipitated the mucin from the saliva with acetic acid. The resulting mucin was then washed with distilled water and shaken with an ammonia solution for one minute. This was then filtered and the filtrate tested for protein by the xanthoproteic (Mulder's) test. As mucin is mainly protein, a test for its solubility is a test for protein. Table 3 shows the relative solubility of mucin in ammonia and other solutions.

In an attempt to observe clinically the effect of ammonia on the cleansing of the teeth, we prepared a 0.006 solution of ammonia and supplied it to a number of patients who are very susceptible to caries and who have abundant dental plaques. First, we stained the plaques with disclosing solution and noted and recorded the findings. The patient was instructed to hold the solution in the mouth for one minute before brushing the teeth. The teeth were again stained two weeks later and the plaques were in all cases greatly diminished and in some cases entirely absent. These results indicate the effect ammonia has in the control of caries.

Table 3.—Relative Solubility of Salivary Mucin in Different Solutions as Estimated by the Xanthoproteic (Mulder's) Test for Protein

	Solutions*	Strength of Solution
1	Ammonium hydroxide†	1.000
2	Ammonium hydroxide†	0.005
3	Ammonium carbonate†	1.000
4	Sodium and ammonium phosphate‡	1.000
5	Ammonium sulphate‡	1.000
6	Calcium chloride‡	1.000
7	Ammonium phosphate‡	1.000
8	Ammonium chloride‡	1.000
9	Ammonium acetate#	1.000
10	Ammonium oxalate#	1.000
11	Distilled water#	
12	Sodium hydroxide†	N/100

*In order of their efficiency
†Soluble
‡Slightly soluble
#Nonsoluble

In the investigations of dental caries,

the matter of diagnosis is most important. The mere presence or absence of caries at the time of examination is not sufficient basis for a diagnosis of the case as carious or noncarious. Caries is a transient process, and very often it is present for a time and then is absent. As all of the cases reported by us have been observed for a long period, we may safely place them in their respective classes. Often a case will present itself which, from all clinical manifestations, appears to be one of active caries, and after a year or two, restorative measures having been taken care of, no new cavities develop. Such a case obviously was one of arrested caries, yet no way has been available for correct diagnosis except observations over a period of months or years. The opposite circumstance also is very common. An examination reveals no indications of active caries, yet the patient returns after several months and many carious spots have developed. We feel that we now are able to make a diagnosis by the ammonia content of the saliva. We have observed several cases wherein the ammonia content was low, yet no caries was present. After some months' observation, caries invariably developed. In other cases, the ammonia content of the saliva was high and cavities were present, yet no new cavities developed during a long observation period. We feel confident in recommending the practical use of the salivary examination for ammonia as a diagnosis for caries.

Activated saliva was used in all the analyses. The patient chewed paraffin and the saliva was collected in an open beaker. The p_H was determined colorimetrically, 0.02 per cent bromthymol blue being used as the indicator. The ammonia estimations were made by the permutit method, described by Folin and Bell.

While we are convinced that the variable ammonia in the saliva is a most important factor in dental caries, we do not wish to convey the impression that all the phases of caries have been explained, but we do wish to emphasize the fact that our findings indicate that ammonia is an important immunizing factor.

PRACTICAL OCCLUSION AS APPLIED TO FULL DENTURE CONSTRUCTION*

By JOHN B. LaDUE, D.D.S., Chicago, Ill.

THE principles upon which this presentation is based are five in number: 1. There is but one law of occlusion. 2. The temporomandibular articulation is, within limited ranges, a universal joint. 3. The application of exact mechanics to an unstable foundation is contrary to all engineering principles. 4. The presence of cusps and overbite in full denture construction is the greatest factor in the destruction of supporting tissues. 5. The apex of the gothic arch serves to locate correctly the centric relation of the jaws one to the other.

The law of occlusion permits freedom

*Read before the Section on Full Denture Prosthesis at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 7, 1934.

of movement of the mandible during function in all ranges and provides for mechanical balance when the teeth come in contact at the finish of a masticatory stroke.

The temporomandibular articulation is, within limited ranges, a universal joint. It serves to cope with and harmonize with the occlusal changes that occur in man's dentition from the cradle to the grave. The wide range in registrations taken of condylar inclinations in the same patient is evidence of its universal movement. It is doubtful that any two dentists, each working separately, could secure identical registrations in the same patient. It would be accidental if any two operators gave exactly the same vertical opening in any given case, and any change in vertical dimension would result in a different condylar inclination. Several complete dentures may be constructed for the same patient, each set with a different vertical opening and different condylar inclination, and each set will apparently function properly. These facts seem to be proof that the condyle, instead of being a guiding factor, is really guided by occlusal conditions and that George H. Wilson's statement made many years ago, "The mandible is guided by the tactile sense of the cusps," is still fundamental.

Several years ago, an engineer told me that it was against engineering principles to apply exact mechanics to a superstructure constructed on an unstable foundation. Recently, another engineer said to me, "If we apply the same degree of exact mechanics to the construction of a locomotive that you dentists are attempting to apply to the structure of artificial dentures, the locomotive would wreck itself in a thousand miles because of the instability of the roadbed which supports the track upon which the locomotive runs." An articulator which will reproduce mandibular movements and allow for the mobility of supporting tissues and for the compressibility of the articular surfaces in the glenoid fossa is a myth and deserves a place alongside of the Holy Grail, the Magic Carpet and the Fountain of Youth. There are dentists with rare technical ability and sound judgment who can use these highly developed instruments and achieve results that are not excelled. It is a far cry from the work of these few persons to the type of service that is rendered to the vast majority of humanity. To the man in general practice in which denture construction is only an integral part and who must depend on the commercial laboratory for technical construction, the human masticatory apparatus is recommended as an articulator. It does reproduce functional movement in that particular case. If a theory can be applied to occlusion, it must be the spherical. Each single movement of mastication may be described by the arc of a circle which is a part of a sphere. As we have thousands of movements of mastication from varying centers and only one arrangement of teeth must accommodate them all, the end-result can only be a composite curve peculiar to a particular jaw. The best way to obtain this composite curve is from the jaws that are going to use the dentures.

One of the greatest problems that dentistry has to deal with is cusps and overbite wherein all of the occlusal surfaces are either renewed or replaced. Nature gives us a good illustrative lesson. Any dentist who has had a few years of practice can immediately call to mind patients who have come in for service with a practically full dentition and a negligible amount of destruction by caries. These patients, having passed middle life, have worn down the cusps of the molars and bicuspids through function. This condition shortens the vertical dimension, and the mandible is thrust forward and ex-

cessive pressure is applied to the anterior teeth. As a result of this constant trauma, the investing tissues surrounding the teeth become inflamed and, in a comparatively short time, there is pyorrhea and the anterior teeth begin to protrude. The same condition applies to full dentures and with just as disastrous results. Full dentures may be constructed skilfully with cusps and overbites, but, owing to the stress of mastication, absorption of the supporting tissues takes place, the vertical dimension is shortened and the mandible attempts to come forward. The resistance of the accurately ground, inclined planes of the cusps is greater than the strength of the supporting tissues and, as a consequence, they deteriorate. This is the principal mechanical condition which explains the fact that four out of five mouths that have worn full sets of artificial dentures for a period of five years may be classed as dental wrecks. By use of the so-called two-dimensional or cuspless type of tooth, with an overjet rather than an overbite, many of these tragic results may be eliminated. When absorption of tissue takes place, under the pressure of mastication, the absence of cusps allows the mandible to drift forward with little or no resistance and without apparent damage to the ridges. This result persists even to the point of appearing prognathic and is an excellent means of determining whether the case should be rebased or rebuilt.

The establishing and registration of the correct centric relation of the jaws, one to the other, is a most important phase of denture construction. The best method employs a gothic arch tracing. When the registration is made intraorally, with a central bearing point of contact, the tracing is clear and well defined. If the cuspless type of tooth is to be used, the apex of the arch may be accepted as a basis for establishing centric relation, regardless of any habitual position that has been acquired by previous occlusal conditions.

I wish to present a series of steps in procedure by means of which any dentist with average mechanical ability can produce full dentures that will be comfortable and efficient, using Nature's own articulator, the human masticatory apparatus, and posterior teeth which are easily adapted to the peculiarities of individual jaw movements, offer a minimum amount of resistance to functional movement and have superior masticating efficiency.

These teeth, the invention of Rupert E. Hall, are called "inverted cusp" teeth. The periphery of the occlusal surfaces appear as flat planes. Instead of the conventional cusps, cup-shaped indentations are placed in these surfaces. When the opposing teeth glide over each other during functional movement, the edges of the cusps act as do cutting boxes in grinding machines. The periphery is thin and offers but little porcelain contact, a minimum of surface resistance resulting.

If we assume that we have taken satisfactory impressions and made suitable casts, the next step is to construct the occlusal rims, preparatory to establishing centric relation of the mandible to the maxilla. There are several methods of arriving at this relation. I employ a gothic arch tracing, using a central bearing point. The upper occlusal rim is made of modeling compound placed on a sandarac base. The rim is trimmed to the length desired for the upper anterior teeth. The lower rim is constructed entirely of modeling compound. This is trimmed to a point shorter than the height required for the lower teeth. On the surface of the upper rim is placed a steel plate, through which several holes are drilled and threaded. One of these is to receive a screw which acts as the central bearing

point. To the lower rim is attached a plain steel plate. The occlusal rims are then placed in the patient's mouth and the central bearing screw is turned to the proper height to obtain the desired vertical dimension. A thin coating of black carding wax is allowed to flow over the lower plate. The patient is then instructed to bring the jaws in contact and to make any and all possible movements. The result will be a well defined gothic arch traced in the wax. With a No. 3 round bur, a slight indentation is made in the metal plate in the exact apex of the gothic arch tracing. The lower rim is placed back in the mouth and, when the jaws are closed, the central bearing registration point will drop into the indentation. With the jaws in this position, the upper and lower rims are sealed together with a small metal tray covered with heated, low fusing modeling compound, which is chilled and removed from the mouth. This method of registration was given me by the late Charles J. Siddall.

The casts are then placed in the compound and mounted in a sturdy plane-line articulator with a stop pin in front, and wax baseplates are adapted to the casts. The upper teeth are then set to the length indicated by the trimming of the upper occlusal rim. The entire complement of lower teeth is then placed in position on the lower wax baseplate. By the use of a brush gas flame over the posterior teeth and by placing a template on the occlusal surfaces, while the wax is soft, the teeth are adapted to the arbitrary 4-inch curve of the template. The upper posterior teeth are then set in apposition to the lower. Care must be exercised to allow a sufficient overjet, in the posterior teeth, to prevent biting of the cheeks. In cross-bite cases, the reverse is necessary.

After checking up in the mouth of the patient, the case is then taken to the laboratory for completion.

When the patient comes in, the dentures are placed in the mouth and strips of carbon paper laid on the occlusal surface of the lower teeth and the patient is instructed to move them in all directions. The high spots indicated by the carbon markings are reduced with mounted stones in the dental engine and the anterior teeth entirely freed from contact. The case is reinstated, carborundum paste is applied to the occlusal surfaces and the patient is told to chew in all directions. In a comparatively few moments, the arbitrary curve, to which the teeth were set, becomes a composite curve, peculiar to that particular jaw. This composite curve accommodates each and every movement of mastication without dislodging the dentures and gives freedom of movement with a minimum of resistance.

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THE PSYCHOLOGY OF PAIN CONTROL*

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Introduction

Survey of Pain Problem

1. *Pain as the Most Primitive Sensation.*—What is pain? Pain, accurately speaking, is distinctly a mental interpretation and cannot be strictly defined. It is the most primitive sensation, because it is the knowledge or conveys the knowledge that some factor incompatible with life or bodily well-being is a part of the immediate environment. The primitive character of pain is exemplified by a microscopic study of the nerves carrying this special sensation. In the first place, pain nerves are among the first to develop parallel to other early embryonic structures, and are never medullated like all special nerves conveying the higher sense functions and mental associations which we call reasoning. There is necessarily a conscious element needed before we can specify a sensation as painful. Pain is, therefore, the result of perception and interpretation by the mind of more or less violent stimuli. Thus, there must be an area wherein sufficient nervous mechanism exists in order to have correlation and memory.

2. *Elimination of Stumbling or Guesswork.*—Every project carried to a satisfactory conclusion has been carefully analyzed and planned in advance. In medicine, we call this preparation for work diagnosis. The greater the study put on oral and physical conditions, the clearer the plan, and the clearer the plan, the more definite the procedure and the more satisfactory the results. You might ask what bearing this has on the problem of pain. A stumbling procedure necessarily excites a train of undesirable reactions. Lack of confidence, nervousness, defense reactions and, above all, fear are created in the patient. Even in preparing a simple cavity, a definite plan is necessary. Each step should be visualized beforehand and each instrument selected with assurance to accomplish a definite amount of work. The slogan "The mind before the eye and the eye before the hand" applies to every dental procedure and its adoption will do much to eliminate pain and inspire confidence.

3. *Patient-Dentist-Time Element.*—The discomfort of a dental operation is often in direct proportion to the time spent on it; consequently, definiteness, precision and reasonable speed can do much in minimizing discomfort. When the patient is confident in all things, the dentist is allowed to proceed uninterruptedly to the conclusion. In other words, the patient-dentist relationship must be satisfactory to economize on time, and this desirable state of affairs can exist only where ability coupled with a plan is evident to the patient.

4. *The Value of Psychic Diagnosis.*—It is as important to study one's patients from a psychic standpoint in order to establish a satisfactory relationship as it is to make a physical and oral diagnosis

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 7, 1934.

in order to achieve satisfactory dental results.

5. *Clear-Cut Patient Differentiation: Its Necessity.*—A knowledge of types of people is obviously essential in order to understand the patient and have some basis for establishing a desirable relationship. Of persons, as of teeth, very few can be said to be true to type. For example, there are ovoid, square and tapering types of teeth and there are persons who conform to the types, but the true type is not so common as the combined types. We can say, nevertheless, that a person tends toward a certain type and, knowing reactions common to this type, have a working basis for dealing with him. Ability to analyze people, and ability to handle the various types, is a prime requisite to success in any field of endeavor, and is essential in controlling pain and its allied emotions.

6. *Preparation of the Patient.*—Knowing the individual patient, the dentist is able to allay undesirable emotional reactions and inspire confidence. Dental success is intimately bound up in this proper handling of the patient. Especially is it necessary during the first appointments to fortify the patient and assure his mental and physical comfort.

7. *Valuable Information Gained by Patient Discussing Own Case.*—The patient should be allowed at first to discuss his case, and such history should be recorded. In this manner, a basis for psychic analysis is obtained. Allowing him to relate incidents concerning former dental experiences and reactions also tends to eliminate many a pitfall for the dentist in doing his work and handling the patient.

8. *Psychic Diagnosis.*—If time permitted, an attempt at classification of patients from a psychic point of view would prove valuable, that a tangible method might be used as a guide. To give clarity to what will be said, it may be well to keep in mind that few people are true to type in all details, but one may decide toward which of the following personality types the patient may tend. In discussing personalities, one should have in mind the two major divisions of human personality; namely, the introvert and the extrovert. The introvert is influenced chiefly by the vago-autonomic or parasympathetic system; whereas, the extrovert is influenced chiefly by the craniosacral autonomic or sympathetic system. These two systems are antagonistic; the first, or parasympathetic, depressing, and the second, or sympathetic, exerting an exhilarating effect. Herein, then, lies the system for the creation of unpleasant and pleasant feelings. Having these facts in mind, the reasons for the tendencies and responses of certain types are made clear.

THE PSYCHOLOGY OF PAIN

1. *Bodily Responses to Pain and Their Significance.*—Dentists are coming to realize that teeth are not isolated members of the body, but influence and are influenced by all changes. Likewise, psychology teaches that every stimulus in our environment, both external and internal, influences and has lasting effects on the body and its future reactions. How often have we been guilty of causing unnecessary pain and a possible train of disastrous bodily impairments. Because of the infinite skill our profession requires, we realize that it is the minutiae that count. A faulty margin, recurrent decay, abscess followed by infected heart tissue and possible death, may in sequence be the result of carelessness. An analogous sequence may follow a series of extremely painful dental experiences.

The bodily responses created by emotions have been given; similar responses are also created by pain. Digestive stasis

following a painful dental operation may last for an unbelievably long time, and ensuing bodily debilitation makes one a fit subject for many of the numerous diseases.

2. *Pain Resulting in a Form of Shock.*—The cause of postoperative fatigue: With profound shock, we have been familiarized, but of the less obvious partial degrees of shock we have taken no cognizance. The effect of pain is nerve nephelation or even vacuolation, depending on the time, extent and severity of the stimuli; nephelation being a condition wherein the cells become swollen and cloudy from pain transmission and are temporarily unable to function; vacuolation being permanent whole nerve destruction with a formation of clear vacuoles. Such a state, continued long enough, results in surgical shock. Permanent destruction and real surgical shock rarely take place in a dental practice, but partial damage often does take place. Here, we have a definite histopathologic basis for explaining many of our psychologic problems, the reason for patient reaction during and after painful operations. Although various other factors, such as the associations of the patient and his mental equipment, contribute toward nervous, fearful, hysterical states, it is obvious that nerve impairment is the inciting factor in undesirable psychologic reactions.

Have you ever noted the exhaustion following an hour spent with the dentist when the patient is subject to pain? Have you ever considered the responsibility of the dentist in causing severe suffering during operations and the possibility of subsequent accidents to the patient owing to this nerve injury? Also, have you ever given any thought to the attitude of boastfulness on the part of patients who have been to their dentist? Is it complimentary to dentistry for them to boast of having spent an hour in a dentist's chair?

Complete blockage of stimuli which cause pain is the safest means of control. Control of pain and emotional response depends just as much on knowledge of the patient as on the method of treatment. It is a common observation that certain dentists have the faculty of arousing favorable emotional reactions on the part of new patients. The outstanding reaction is one of confidence. On the other hand, many are not so successful and are continually annoyed at the loss of valuable patients. A display of instruments in the operating room is frequently a thoughtless gesture on the part of dentists and is more frequently due to satisfying a desire for ostentation than a matter of convenience. It has the opposite effect to that intended.

Bodily changes resulting from pain: Keeping in mind the fact that every stimulus sets up a series of bodily responses, the extent of which is partially dependent on the potential force and duration of the stimulus, and that pain, besides being an extremely potential stimulus, causes an hereditary reaction in man, we can deduce that, in the majority of cases, bodily changes will take place in even minor pain stimuli unless an especially potent inhibitory force is exerted by the cortex. Many of the immediate responses of reaction to pain and emotion cannot be enumerated, but it should be stressed that, for every reaction, there are also supplementary reactions. Postoperative fatigue or mild shock, the cause of which has just been given, may be considered one supplementary reaction; continued intestinal stasis, also previously mentioned, is an additional reaction. There are many less tangible reactions, such as various associations stored up in the subconscious mind, which influence in a definite manner future behavior and decisions.

3. *Pain from the Patient's Point of*

View.—The operator is inevitably influenced by the state of the patient. The effect, working essentially in the same manner as on the patient, can be classed as physical and psychologic inasmuch as an emotional state is created. The reaction is physical in that the cortical or higher control is lessened, and psychologic because the operator's efficiency and dexterity are lessened. Working under these conditions, an operator is not in complete command of the situation, with the result that the operation becomes more painful and the patient more emotional. Consequently, a vicious cycle is created. No patient can have great confidence in a dentist who continually subjects him to the most unreasonable pain, with no apparent effort to prevent it. The economic effect of this situation is important to the dentist. To him, it means a dissatisfied patient, a loss of time, a loss of new patients through reference and a possible loss of the individual patient.

A really good dentist may actually be a failure in the practice of dentistry. Fear of dental work is considerably lessened when the patient feels that his dentist understands him. The dentist must make a deep study of each relationship if he is to succeed.

Efficient methods of controlling pain are the greatest practice builder. Patients do not sidestep dental care because of its cost, but on account of the pain association. Two interrelated major pain factors must be controlled: the physical and the psychologic. The dentist who fails to take into consideration and arrange for the elimination of uncomfortable or painful stimuli must of necessity be only a partial success.

Previous dental associations and experiences: It may be well for a dentist to keep in mind the fact that patients are constantly making comparisons, and the operator's status in the patient's mind depends largely on how much pain he creates in comparison with other dentists. The comparison may be even more subtle than this, as the dentist may be a source of aversion to the patient owing to the fact that he may be responsible for a series of undesirable subconscious associations. For example, a patient may have had a previous painful experience in another dental office and may associate an extremely vibrating handpiece with pain. The second dentist may cause little actual pain, but may use a poor handpiece and consequently is subconsciously placed on the same status in the mind of that patient as was the previous dentist.

Pain; prejudice: The common psychologic pattern of pain—associations—dental prejudice must always be kept in mind. This pattern may or may not be carved into the nervous system of the patient, but, in every case, each dentist's duty demands the same diligent service and his status depends on the elimination of the first two factors: namely, pain and its associations.

4. *The Relationship of Fear and Pain.*—In studying the neurologic basis for the relationship of fear and pain, it is clear that the basic importance of the thalamus in psychology lies in the fact that it is the seat of all sensations, feelings and emotions which the individual is capable of experiencing, the extent of which is determined by the cortex, in normal behavior.

The consciousness of pain is located in the thalamus, and pain is given various qualities by means of the connections with the cortex, and fear is the result of impacts derived from the various nuclear aggregations of the thalamus, the centromedian included. But this relationship of pain and fear does not tell the whole story: It should be noted that the medial nucleus of the thalamus correlates extroproprio and interoceptive impacts. In

fact, it is the primary or trigger zone of the autonomic nervous system, which in turn controls many of the so-called emotional symptoms of pain and fear. It is a significant fact that these symptoms of fear and pain closely resemble one another. In fact, Cannon classes them together for description and interpretation. He interprets the symptoms as a mechanism for defense. Many of them are of a vestigial character. The manifestations are contraction of vessels, or pallor, cold sweat, stopping of salivary flow, dilation of pupils, raising of hair, rapid heart beat, rapid respiration and trembling or twitching of muscles, especially of the lips. The emotions also affect digestion, as it has long been known that the flow of saliva and gastric juices is favored by pleasurable feelings and inhibited by those that are not pleasurable. Also, the gastric and peristalic waves are changed by unpleasant emotions, resulting in a torpid stomach and stagnation of its contents. An inhibition of secretion of the gastric juices and peristalsis may last for several hours, often resulting in vomiting, diarrhea or sickening pains. Other results of pain and emotion are increased coagulation time, increased blood sugar as a source of energy and the driving of blood out of the vegetative organs of the interior, which serve the needs of the body, into skeletal muscles to meet the extra action of struggle and escape. These reactions exemplify the fact that they have had for their purpose body preservation, but today, even though man in most cases reacts as did primitive man, he no longer has need of the foregoing responses.

The thalamus not only brings about the above-mentioned symptoms through the autonomic stimulation, but is also profoundly influenced by the internal secretions resulting from autonomic stimulation. The autonomic system, as we have seen, consists of both sympathetic and parasympathetic systems, which stand in physiologic antagonism to each other. The sympathetic or catabolic group, affecting the thyroid, pituitary and chromaffin systems, increases metabolism and promotes the release of energy; whereas, the parasympathetic or anabolic group, affecting the thymus, parathyroid and pancreas, inhibits the release of energy. Excessive stimulation of one or the other produces mania or melancholia. Thus, the sympathetic system decreases the dynamic resistance of the thalamus, while the parasympathetic increases its dynamic resistance. From the symptoms involved in pain and fear and from the effect of the internal secretions on the thalamus, the practically inseparable relationship can be easily deduced. The choice between the two autonomic systems, though largely reflex through the thalamus, is fortunately controlled largely by the cortex. It is this fact which makes man a superior animal.

There is every variation from the normal reaction patterns shown. It is the daily experience of every practitioner to see abnormal or subnormal display of fear manifestations due to pain, or the profession of pain due to fear manifestations. These various conditions can be explained on the neurophysiologic basis. People may be said to be born to display fear, also interpret fear manifestations as pain. This condition may be due to a lack of cortical neuronic development, the reason for which is not in the scope of this paper, or bad psychologic environment during early life, or special unfavorable association patterns. Furthermore, a normally neuroned person may give way to manifestations of undue fear owing to the high potentiality of the stimuli overcoming the suppressive ability of the cortex. It is thus seen that every thought, action and emotion, normal and abnormal, can undoubtedly be interpreted by a neuro-

physiologic pattern mechanism. Consequently, no follower of the healing arts can hope to deal successfully with this important psychic problem of pain and fear except by knowing and understanding at least these basic fundamentals of neurology and physiology. With such knowledge, much of the bunkum of handling patients can be eliminated, and a less emotional attitude can be maintained; which is essential in dealing with persons having incomplete control over themselves and in trying to help them maintain control while under your care.

The fear pain threshold: From the past discussion, it can be seen that no two people react alike to the stimuli of pain nor are they the same as regards fear; in other words, their fear and pain thresholds vary. This is due in part to differing inherited mechanisms and in part to the environmental conditions to which they have been subjected. The state of one's health can be considered one's internal environment, and it is common knowledge that a person rather sickly is more apt to feel pain and be fearful; in other words, have a low threshold. In regard to one's external environment, a little bit of research undertaken at Johns Hopkins Hospital might well exemplify our point:

> Dr. John B. Watson, the eminent psychologist, put two groups of 18-months old infants in two separate rooms and let snakes and rats run around among them. The group of children from normal homes hollered. The other group, consisting of babies born and raised in the hospital and thus protected from the fear suggestions planted in most children, permitted snakes to crawl over them, watching them with delight. Experiments like this indicate that practically all our special fears are cultivated and not natural. . . .

5. *The Extreme Importance of Association.*—I have previously in this paper brought out the fact that associations have an extremely important bearing on our problem, but now it would be well to discuss what psychologic principle is involved in this problem. It has been mentioned that pain gives rise to fear, owing partly to an hereditary mechanism and partly to learned associations. Now a person having his first dental appointment views a dental engine with little or no special response, but having undergone a painful experience, will possibly develop an association of: dental engine —fear, without any pain whatever. This principle of conditioned response applies not only to sight, as exemplified, but also to odors, such as the medicinal odors in some dental offices, and to sound.

6. *Therapeutic Measures Involved.*—From the past discussion, the fact can be gleaned that pain control involves more than the mere use of a local anesthetic, at least to those of the profession who conscientiously desire a satisfied clientele.

Patients come to us with a multitude of unfavorable reaction patterns, and it is not enough that we create no new unfavorable pattern, we must aid in the suppression of those which he already has. Let us enumerate the avenues wherein we may approach satisfactory pain alleviation: (1) development within oneself of proper personality; (2) proper application of psychologic principles; (3) proper use of anesthetics and sedatives; (4) dexterity of performance; (5) knowledge as to how to eliminate numerous small painful incidents in dentistry, and (6) elimination of deleterious associations, e.g., vibrations, discomfort, unpleasant environment, etc.

Relationship of Vibrations to Pain

Attention is directed to the following facts which are important in the problem of pain control.

The central nervous system can attend to only one thing at a time. As a rule, if two stimuli are applied simultaneously

at different points, the reaction ensuing will be a response to one of the stimuli, the more effective. In physiologic terms, every effective reaction inhibits every other reaction.

Sounds have been divided arbitrarily into two classes: tunes and noises. The former produce pleasant and the latter unpleasant (harsh, grating, scratching) sensations. Between the two extremes fall all of the sounds of everyday life. Sound is propagated by waves consisting of alternate compressions and rarefactions which travel through a medium. Any medium which has the properties of elasticity and mass can conduct sound. Thus, solids, liquids and gases are efficient conductors. Sounds reach the auditory center in the brain in two ways, via bone conduction and air conduction. Air conducted sounds travel through the auditory meatus and cause vibrations of the tympanum. Through the mechanism present in the middle ear, they are forwarded to the eighth or auditory nerve and then to the thalamus and cortex, where the sounds are registered and identified. Bone conducted sounds travel through the bones of the head to the same centers. Bone conduction of sound is the method used extensively by people who have impaired hearing.

The primitive function of the whole nervous system is reaction. In regard to the reflex phenomena, the tendency to the exaggeration of symptoms by people with a hypersensitive nervous system must always be borne in mind.

Psychologic phenomena are based on the fundamental law of stimulus and response, known as S-R. Sensations are carried to the brain through one or more of the senses. Mental impressions result, images are created, attitudes are definitely established, reactions surely and definitely follow, each in regular and logical order as the links of a chain.

An axiom as old as our literature is "As ye sow, so shall ye reap." The expressed attitude of people toward dentistry and through it toward dentists is created primarily by the sensation painful in nature originating in the field of dental operative procedure.

Both ends of the chain are held by the dentist. He gives, he receives. Adhering to the recognized law of stimulus and response, he starts on the way to the brain of the patient annoying or painful stimuli. Response on the part of the patient is one of aversion toward dentistry.

There are three states of sensory mental activity: pain, indifference (neutral) and pleasure. The state of a conscious individual is determined by his experience. Through a succession of dental experiences, a patient has recorded in his memory an aversion for the most elementary of all dental procedures; namely, the use of the dental engine. These impressions, while frequently minimized through the intelligent use of local anesthesia, persist, and are freely commented on. On countless occasions, patients have voluntarily expressed their views on dentistry, particularly on the dental engine.

Doubtless a certain amount of this reaction can be accounted for by the fact that extremely sensitive cavities have been prepared without due protection of the patient's nervous system by injections relieving him of this wholly unnecessary and very harmful experience. While there may have been some excuse for this semibarbarous treatment of patients during and preceding the period of development of local anesthesia, there surely can be no excuse for continuing it at the present time.

The use of procaine and other local anesthetics has been so simplified that we are now able to prepare cavities in all teeth without actual pain. One might then assume that this is all that would be

necessary and that the dentist had carried out his professional obligations to his patients by the expert and wise use of the hypodermic, preparatory to cutting into teeth.

If his work were confined to soft tissues, this would doubtless suffice; but he is, in working on the human teeth, making contact with part of a system that has baffled his best efforts to render the practice of his profession a pleasing or at least an indifferent experience on the part of his patients.

While there is no actual pain sensation in the tooth enamel so far as touch is concerned, the instant contact is made with a human tooth, a message is flashed through the bone conduction of sound, to the thalamus and cerebral cortex, and the patient knows that the dreaded moment has arrived. This sound passing through the tooth to the alveolar bone and to the other bones of the head is definitely recorded as a sound. As previously mentioned, sounds are tones which are pleasant, noises tones which are unpleasant. When a rapidly revolving bur, stone or disk in the dental engine comes in contact with a tooth, the sound recorded is a noise of the most disagreeable type. An analogy, without the association of actual pain, would be found in holding two pieces of sandpaper in contact close to the ear and rubbing them together. This can be tolerated for only a short space of time, when one instinctively recoils.

Revolving a stone disk or bur on a tooth has exactly the same effect. A continuous extremely disagreeable noise is poured into the auditory centers of the brain. Owing to previous experience, this noise is interpreted as the forerunner of severe pain. As the primitive function of the whole nervous system is reaction, we observe without any possibility of error that human beings, owing to their experience in the past, have a reaction toward dentistry that is extremely unfavorable. This reaction is not confined to dentistry, but extends to the members of the dental profession themselves. The contrast in the attitude of patients toward their physician and toward their dentist is an illustration of this point. Ninety per cent of all diseases either begin with or have pain as a prominent symptom. People have come to look on their physician as the one who can relieve them of pain, the only part of their ailment that they are able to identify. His treatment has as its objective the speedy relief of pain. Seldom does he do anything to increase it. On the other hand, they have come to look on their dentist as one who in the treatment of their troubles, whatever they may be, causes them in many instances extreme pain. Their feeling, therefore, no matter how diplomatically they may conceal it, toward their physician and their dentist is bound to differ, the advantage, of course, being in favor of the physician. This is the big problem that dentists have to face and for which they must find a solution. This can be done.

Recalling that the central nervous system can attend to only one thing at a time, many attempts were made in a series of experiments extending over a period of fifteen years to divert the attention of the patient from the work being done on the teeth. During this time, every effort possible has been made to protect the patient from actual pain by the use of local anesthesia. Motion pictures, radios, vibrators, phonographs and other means were used and discarded because they afforded only indifferent results. Several years ago, a "near" discovery was made when ear phones carrying music from the radio were placed on the patient's head. Little did we realize how near we were to discovering the real secret. While very close, we were just far enough away to become

discouraged through the poor results obtained, and so gave up the experiments.

Later, the experiments were resumed and all attempts at air conduction of sounds (via the ear) were abandoned, and we concentrated on the same method of sound conduction as that which we were trying to dethrone; namely, bone conduction of sound created by the rapid revolution of burs and stones on the teeth. The experiments, which lasted for a considerable time, led finally to a point where success rewarded our efforts, and we had discovered the means whereby we could successfully sidetrack the sounds of tooth grinding and prevent their being carried to the auditory centers of the brain. As a rule, if two stimuli are applied simultaneously at different points, the reaction ensuing will be a response to one of the stimuli, the more effective. This has led to the construction of the radio chair (for want of a better name), which will later be described in detail.

The Psychology of Music During Dental Procedure

It has been said that where music appeals at all, its appeal is stronger than of any of the other arts. Thus, if music is handled intelligently, and specifically for the purpose intended, fulfilling all psychologic prerequisites, we find that we have a powerful weapon whereby associated factors of pain may largely be eliminated.

PSYCHOLOGY OF RHYTHMIC VIBRATIONS

Music exerts a threefold psychologic force, the first being the psychology of rhythmic vibrations. Experimental studies reveal that rhythmic vibrations such as music tend to minimize the dissonant vibrations resulting from noises. This condition is due in part to certain characteristics of sound vibrations, and to man's physiologic makeup. This principle has the greatest effectiveness where the medium of transmission remains the same. Consequently, if the medium of transmission is bone, as is the case with bur vibrations, the rhythmic vibrations should be transmitted in the same manner for satisfactory results. An additional factor worth noting is that rhythmic vibrations, bone conducted, tend to blot out air-transmitted vibrations. Thus, noises made by instruments and talking will not be apt to disturb the patient. The final fact in the psychology of rhythmic vibrations is that such vibrations are more acceptable than those of a dissonant character, the reason being based in part on a painful quality inherent in continued dissonance.

PSYCHOLOGY OF ATTENTION

The tendency to concentrate on music is the second psychologic force which aids us in our problem. Neurologically speaking, the stronger stimulus, because of inherent potentiality and the construction of the nervous mechanism, gains the pathway to consciousness. Conversely, a weaker stimulus usually does not gain attention in the presence of the stronger. Also, it should be kept in mind that pleasurable stimuli are more acceptable than nonpleasurable. Consequently, because music is an exceedingly strong stimulus and also pleasurable, it tends not only to maintain control over the nerve pathway of hearing, but also to depress sensations received from other sources. Alert dentists have appreciated the values bound up in the psychology of attention and have tried various means, chief among them being conversation, to distract the individual from his present position, with only partial success. Because of its inherent characteristics, we feel that music properly handled provides the best agent in attention psychology, for our purpose.

PHYSIOLOGIC-PSYCHOLOGIC EFFECT OF MUSIC

This phrase "music properly handled" introduces the third psychologic force; namely, the physiologic-psychologic effect of music. Numerous tests have been made showing that various types of music exert profound changes in cardiovascular balance. Keeping in mind what has been said earlier in this paper about the autonomic nervous system, the extrovert and introvert tendencies, the psychology of associations, and the fact that changes in the cardiovascular balance mean fundamentally stimulation of the sympathetic or parasympathetic divisions of the autonomic nervous system, a basic insight into music psychology and its application to our purpose may be glimpsed. Thus, vocal and instrumental music may be selected that may excite or inhibit cardiovascular reactions, the effect of which might inhibit irritability, act as a sedative, arouse optimism and be used as a valuable agent for various purposes. For example, the toreador song from "Carmen" increased functions of the cardiovascular system; whereas, a lullaby played on the violin proved sedative for all persons sensitive to musical tone. These statements are derived from studies made by Max Schoen and Esther Gateweed from reports covering the responses of over 20,000 persons throughout the country showing conclusively the beforementioned effects and the physiopsychologic force of music. Thus, one may choose various selections of music having certain qualities that give a sense of rest accompanied by ideational and imaginative processes. These effects, it might be stated, are the same when the selections are heard at different times and by different persons. It is this type of music which is applicable to our purpose, and with adequate knowledge of music selections, one can determine what to use and what to exclude.

Many attempts have been made to analyze the cause of the delight which normal people take in music of one sort or another. This discussion has been given to provide a sort of basic insight into the reasons for music appeal. In addition, it is fundamental to our purpose to obtain an adequate knowledge of the problem of music selection. This can be done only with a knowledge of at least the fundamental musical qualities.

THE RADIO CHAIR

THE TRANSMISSION PRINCIPLE

In attacking the problem of overcoming the aversion toward dentistry which has inadvertently been pyramided in the minds of dental patients, it was finally decided that bone conduction of sound offered the solution. If tunes (pleasant sounds) could be introduced into the auditory centers of the brain via bone conduction, we should be able to render less audible the noises (unpleasant sounds) carried to these centers in the grinding of the teeth. Various locations on the skull were tried out in this work, and it was learned that the mastoid portion of the temporal bones offered by far the best conduction. Amplifiers applied to these regions gave most encouraging results.

This was, of course, due to the fact that the auditory nerve has its origin in the inner ear and, in this location, sound had the shortest distance to travel before reaching this nerve. This plan was then adopted.

Interesting experiments were carried on in alternating from bone conduction of sound to air conduction (through the ears). The results with a large number of patients seemed to prove that there was a very noticeable difference in the effect produced. When air conduction was employed, the patient quickly returned to concentrating on the sounds caused by the burs and stones. When we

switched to bone conduction, they seemed to forget about the work that was being done and gave their attention to the music which was coming through the headrest.

It is essential to the success of the plan that the set-up be carefully developed. Any suggestion that the patient is to be provided with entertainment during the appointment will give very indifferent results. To set up a radio or phonograph in your operating room, using the loud speaker, and thereby filling the office with unnecessarily loud music, will interest but a few. Experience has shown the truth of this statement.

MECHANICAL DESCRIPTION OF RADIO CHAIR

The device for the transmission of the music, on which experiments are nearing completion, is built into the headrest. Until quite recently, it was necessary to construct a new type of headrest for this purpose. The plan is now so simplified that any type of headrest may be used. If this proves to be feasible, the cost of construction will be greatly reduced. This phase of the idea has been given very serious consideration.

Attached to the back of the chair is a combination switch which can be used either to discontinue the music altogether or simply at one chair, allowing several other units in the office to operate. While the device is in operation, no music is audible to anyone in the office, aside from that obtained when the head is placed in the headrest.

In the left arm of the chair is built a volume control button so that the volume of music can be raised or lowered by the patient. This is quite necessary, as the volume of sound coming from the headrest must always be greater than that created by burs or stones grinding on the tooth structure.

The music is obtained by a mechanical record-changing device which at present will play six or seven large sized records with one loading. The music is transmitted to the radio and from this, by a readjustment of the wiring, it is carried by cables to the various headrests.

The entire mechanism has been in daily operation for several months, but details have been withheld owing to the high cost of the various parts. Experiments almost completed would seem to indicate that a much simpler apparatus and at the same time one with a much greater range will be evolved. This will, of course, materially reduce the cost of the device. The aim, after developing the apparatus to the point of satisfactory performance, is to reduce it to its simplest and least expensive form.

Conclusion

THE ECONOMIC IMPORTANCE OF PAIN CONTROL

It may sound somewhat hypocritical for one to discuss the advantages of cutting down operating time in our present era, but it is a factor and we will put it into the records. We all have patients who, in seeking relief from the strain which they feel while teeth are being worked on, will continually interrupt us and materially interfere with our work. Not only are they relieved of this desire, but their minds are turned in the opposite direction and they now sit perfectly quiet and allow us to proceed as rapidly as we may wish with our work. This has been found to permit planning for more work at each appointment.

As times return to normal, not only will the dentist find his days more enjoyable, but he will also, to his surprise, find that he has materially increased his production capacity.

From facts brought out in this discussion, from personal experience and from statements made by the laity re-

garding pain, we can easily concede that pain control is one of our greatest problems, the mastery of which contributes profoundly to professional success.

1. *Ability of the Operator to Deal with the Pain Factor.*—Like the achievement of technical skill, pain control demands ability, knowledge, concentration, personality and a sincere desire for dealing with the problem.

Pain control a possible goal: A proper, complete and logical presentation of this problem is a difficult task, you will admit, but far greater is the task of mastery and application of the principles presented. Nevertheless, it can be accomplished and complete pain control achieved as a possible goal.

2. *Efficiency—Performance Without Interruption.*—Effect of patient reaction on operator: Pain control not only contributes to professional success, but also eliminates one of the most disturbing factors in the dental office. The effect of patient reaction on the operator can be of a very detrimental nature. Efficiency, performance without interruption, has a wholesome effect, not only on the patient, but also, and equally, on the operator himself.

3. *Efficient Method of Pain Control.*—Gentleness and consideration the greatest recommendation: It is useless to reiterate, in closing, the principles of pain control, but let us not forget the personality factor, for gentleness and consideration are our greatest recommendations. In addition, it is of the utmost importance that we understand reactions on the part of our patients. The best service that we can render, if limited to technical skill alone, will, in the long run, assure only partial success. Through the application of knowledge on this subject of the control of pain as it applies to the whole realm of dental procedure, we will surely effect the desired change in the attitude of the general public toward the practice of dentistry.

In the turning tide today, we decide our own future to a greater extent than ever before. Only superior methods and careful consideration of all contributing factors, not the least of which is pain control, will gain a satisfied clientele from an increasingly enlightened public.

SOME THINGS WE SHOULD NOT DO*

By GEORGE WOOD CLAPP, D.D.S., New York City

WE should not do things that prevent us, either singly or collectively, from winning recognition as professional men who render valuable service, or that destroy such recognition as has been won.

We should not do things that promise a quick financial success by the violation of economic principles that the experience of the ages has proved sound.

We should not do things that make impossible that satisfaction from good service well rendered which is a desirable, enjoyable and important part of a professional man's remuneration.

To an extent which no person in his senses would think possible, thousands of us are doing just the things that prevent or destroy professional recognition, that delude us with hopes of financial success

*Read before the Section on Partial Denture Prosthesis at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Aug. 7, 1934.

by methods that are bound to end in failure and that close against us the doors to satisfaction in life.

Our motives are not generally those of deliberate dishonesty. In the days of easy money, unsound and dishonest practices led to quick and sometimes large profits. Why study and work when more money could be made by a glib tongue and swift methods?

With the passing of easy money came the pressure of urgent financial need. We had been rendered too lazy or too indifferent to painstakingly work out the solution of our professional problems. We failed to perceive that if those of us who are of only ordinary ability are to win success for the whole of our lives, we must be professionally wise, technically skilful and economically honest.

We are inclined to blame on the general depression the present economic conditions in the profession, when perhaps 60 per cent of dentists have lost about 60 per cent of their practices. To no small extent, the blame lies there. But evidence will be presented suggesting very strongly that many of us are suffering quite as much from our own sins of omission and commission as from general conditions. In every community so far studied, there has been a small group that has come through the depression in good shape. In every community, they have shown similar characteristics. They have not been the professional and economic sinners; and while they may not have been professional or economic saints, they are sitting on the right hand of recovery.

It is the purpose of this paper to call attention in a frank and friendly way to some practices which prevent professional recognition and make impossible ultimate success in the matter of money or of satisfaction. These practices seem to be creeping through the profession like a poison. It is hoped to warn dentists who may have consciously or unconsciously adopted such practices that they finally lead to failure in all that the dentist hopes to achieve.

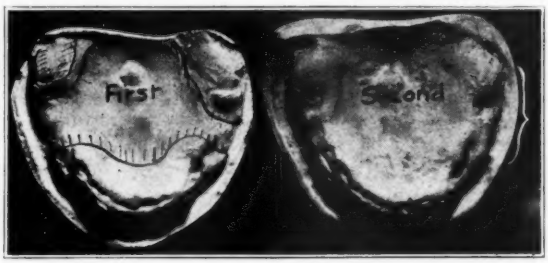

Fig. 1.—Left, impression out of contact in shaded area. Right, second impression, which dentist took under strong protest.

In the course of preparation for a series of addresses in 1933 and early 1934, a superficial survey was made of the financial conditions in the practices of about 10,000 dentists, in different areas in the East, covering several hundred square miles.

For previous addresses, a similar survey had been made of the financial positions of some of these dentists in the spring of 1929, which is supposed to have marked the high tide of what we call "good times." The purpose of the later survey was to formulate a similar opinion

of the financial positions of these dentists in 1933, which is supposed to be the low-water mark of the depression.

From these opinions, it was hoped to learn three things, as follows: 1. What had happened to these dentists during the depression. 2. Why it had happened. 3. The outlook for the future.

ECHOES OF 1929

The first observation will concern 4,000 dentists who practice in one district. In 1929, one in every three among them was financially successful, that is, he had a good and sometimes a fine office, paid for or comfortably on the way to being paid for. He could study and take postgraduate courses. He could live comfortably and sometimes luxuriously on his net earnings and had a chance to save enough to provide a competency for old age or illness.

Fig. 2.—Cast against which full upper was to be anatomically articulated.

One dentist in three was neither a financial success nor a failure. He had a comfortable office and could live comfortably but not luxuriously on his net earnings. He could afford some time and money for postgraduate courses. He could accumulate a competency only by an unusual degree of thrift or through life insurance. A few days of illness or absence from the office would do no harm, but the reserves were not sufficient for long illness or absence from the chair.

One dentist in three was a financial failure. His office was deficient in the equipment necessary for professional service. He could not afford postgraduate courses, unless they were given after 9:30 at night and were free. He could live only meagerly and had no hope of a competency or of any reserves to carry him in case of illness or absence from the office. He had little or no credit for the purchase of supplies with which to conduct his practice.

Thus, at the high tide of general prosperity, from one-third to one-half of the dentists in this district were finding it impossible to live and work as professional men should live and work.

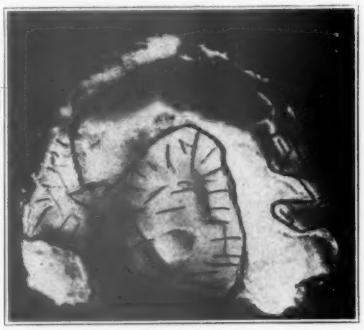

Fig. 3.—Full upper impression in which the first step was carefully taken, the second not. The plaster was out of contact with the tissues in the shaded area.

What happened to these four thousand? Let us now glance at the dentists in this district in the spring of 1933. Conditions had changed greatly from those of early 1929. One-half of the total number could now be classified as financial failures, almost without practice, almost without earnings, almost without credit, almost without hope.

With the deepest personal sympathy for the dentists themselves, these practices were eliminated from further study. That left 2,000 practices to be studied.

Of these 2,000 dentists, about 200 were financially successful in the sense in which that term was proper in 1933, although the figures very rarely compared closely with those in 1929. These dentists were living on their net earnings over office expense. They were living thriftily but comfortably, they were paying all bills promptly, some of them were refurnishing their offices, some were saving money. A very, very few would hardly have known that there was a depression but for the fact that they had lowered their fees, that they were working harder to earn their money, that big cases were fewer and that collections were slower.

About 1,000 others of the 2,000 studied had effected drastic reduction in living and office costs. They showed conditions which ranged all the way from a little more than barely "getting by" to not quite "getting by." Practice or collections or both had fallen off greatly, sometimes as much as 60 per cent. They lived in hope of better general conditions. Observe for the moment that they based their hope of salvation on something outside themselves.

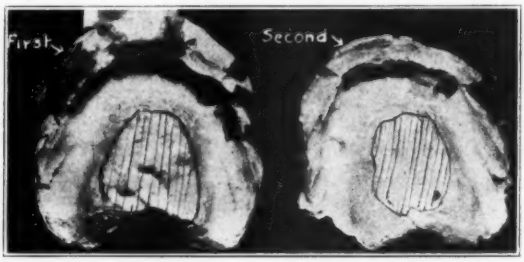

Fig. 4.—Impressions for full palate, vulcanite upper plate, with no clasps. There was no impression in the shaded areas and no impression of the buccal areas.

Fig. 5.—Casts for gold partial dentures. There is poor definition around the teeth indicated by arrows, and no impression in the shaded areas.

The others of these 2,000 dentists could hardly live on the gross earnings of what little practice was left them. They were without credit for the purchase of materials. They were going steadily deeper into debt, and to the dispassionate observer their position looked dark.

Why had these things happened? The

first and natural thought is, because of the depression. That answer is not sufficient to explain some of the things that developed on further study.

True, people had turned away from dentists and dentistry, but they had turned away much more from some dentists than from others. They seem actually to have turned toward some dentists.

In 1929, money and paper profits were plentiful. In 1933, money was scarce. Every expenditure was being scrutinized. Value for each dollar spent was being sought. We who studied came to believe that the public was setting up its own scale of values for dentists and judging them not on equipment and personality, but on the value their service demonstrated, per dollar of fee. People were turning from dentists who, they considered, gave low value in service to those who gave good value in service. They were leaving the low-value dentists to starve.

CERTAIN GROUP CHARACTERISTICS

Certain differences in the characteristics of these groups of dentists are interesting and are important enough to justify a brief glance. The dentists in the successful group were good professional men, good technicians and good business men. While there were among them some men of renown, it was surprising to find how many were unknown to fame. They had for years educated their patients to think of dentistry as a health service to be neglected only at peril to body and purse. They had rendered a high average quality of service which had proved economical to patients, so that when restrictions were necessary in family expenditures, their patients classi-

Fig. 6.—Casts for hand-bent, lingual bar partial denture. The first cast (left) was too short and there was poor definition about the teeth, with distortion in the lingual area. The second cast (right) was also too short.

Fig. 7.—Casts for gold partial lower denture. Both are too short.

fied dental service as an essential. They were good business men in the sense that their fees were remunerative but were economical to patients. They were honest with patients. Most of them reduced fees during the depression and extended credit, but did it wisely, and they and their patients came through well. They were good enough business men to continually make new contacts. Careful study did not disclose one practice with these characteristics that was in distress.

One extremely important point was that the morale of these dentists had not been affected. They feared nothing short of a general economic collapse.

Fig. 8.—Cast made by dentist. The gold partial lower denture shown in Figure 7 was to be articulated to this.

They felt equal to the situation and did not look to outside forces for salvation. The number of these dentists apparently did not exceed 200 in a total of 4,000 dentists.

Some prominent dentists were in the middle group. Most of the profiteers and racketeers were here, for the profession contains thousands of both who are ethical in all dental-social relations. Most of the personality artists were here. Some of the poor business men, too ignorant or too lazy or too clever to be honest, were here.

The morale of this group was badly affected. Their methods did not meet the new conditions. They looked for salvation from without. It is not to be found there. Professional and financial salvation is from within and works outward, especially in times like these.

Those dentists who were financial failures seemed to be, first of all, failures within themselves. They had no vision of the actual value of good dental service and no power or skill of presentation to others. They were limited as to knowledge and equipment. Their service might stop pain and arrest deformity, but they could not tell the story of even that.

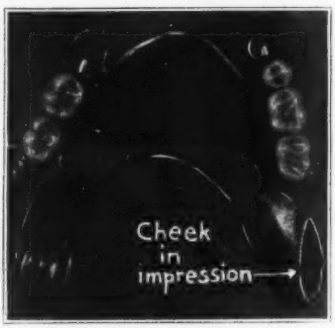

Fig. 9.—Above, denture with weak bar. Below, partial denture in which portion of cheek was included in impression.

They had nothing attractive to offer to discriminating patients.

KILLING THE GOOSE THAT IS TRYING TO LAY THE GOLDEN EGG

Profiteering and racketeering by ethical dentists have been rampant in prosthetic service because, especially in times like these, it has been difficult to make operative work provide a living for the dentist.

Profiteering is a pathologic inflation of fees for one form of service out of all proportion to the earnings from other

forms of service. It may occur in connection with any quality of service. It is temporarily harmful to the patient, but may be fatal to the dentist.

Racketeering is the promise of or charge for professional service without the ability or intention or the determination to render that quality of service.

Both profiteering and racketeering were financially very profitable to many dentists during "good times," but have proved disastrous since then. Their fountains of professional knowledge and technical skill have dried up. They have lost

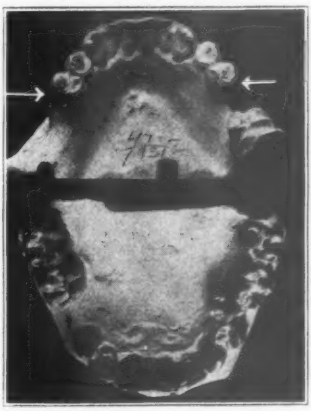

Fig. 10.—Casts in which there was insufficient preparation for occlusal rests, causing breakage.

interest in hard and continuous work at reasonable remuneration. Now that patients decline to submit to profiteering and racketeering and turn away, these dentists don't know what to do. They are all dressed up in pretense and pride and verbal pyrotechnics, and there seems to be no place to go and, worst of all, no one to go with them and pay the bills.

A FEW PRACTICAL APPLICATIONS

No other form of service open to the general dental practitioner can be made so regularly productive of profits over a long period of years as prosthetic service. No other form calls for greater professional knowledge in diagnosis and prescription and greater skill in those steps of construction which, by training, by necessity, by advantage and by law, are confined to the practitioner. These are the impressions and bites, the orders to the laboratory which will adjust the construction to the individual requirements of the patient, and the supervision of every detail of construction to make sure that it is suitable for the purpose that it is intended to serve.

The student of conditions experiences something like a wave of despair to find how general is the conviction among dentists that, in prosthetic cases, they

Fig. 11.—Cast made by dentist for porcelain veneer bridge to be completed in one operation. A bubble where a tooth should be is indicated.

have no responsibility except to charge the patient as much as possible, to send improperly made impressions and bites to the laboratory together with insufficient data, to collect the fee and place on the laboratory the responsibility for the failure which such steps invite.

In one district, where 500 dentists practice, 400 of whom will gladly embrace the chance to make full dentures whenever opportunity offers, three dentists in every four are incapable of taking good impressions and bites; they know little or nothing and care less about mandibular movements and they cannot build occlusion rims to restore expression.

And when they get a fee which would permit them to render high-grade service and still show a profit over the earnings from operative dentistry, they will not pay the laboratory for anatomic articulation on even a simplex articulator, but put the money into their own pockets under the delusion that it is a profit, not recognizing that they have defrauded the patient, that they have lowered themselves in public opinion, because dentures constructed in that way cannot be satisfactory to intelligent people, and that they have done their best to kill the goose which, fed on good service at fair fees, would lay the golden eggs of more and more patients and more and more fees.

In partial denture service, these dentists rank even lower. Most of them are incapable of diagnosis or prescription. One dentist, of good standing in his society, said that he had bought fourteen models of possible constructions, and that when he could fit a patient to one of the fourteen, he ordered the laboratory to make that one. He said, quite frankly, that that was all he knew about partial denture construction.

Even that procedure is far above the average. About nine dentists in every ten in that district take an impression, put the patient off with the excuse that they need time to study, send the impression to a laboratory and ask what can be made in that space and what it will cost. When they get back several designs and prices, their "study" is complete. They start with the highest-priced design and go down the line until they find one that the patient will buy. That district is not much better, and certainly no worse, than the other districts studied.

Any conscientious laboratory man will tell you that prescription and design ought not to be required of the laboratory. They are tasks which the dentist should discharge, because he is the only person who can do them properly. But apparently 90 per cent of the partial prostheses constructed in the United States are made in about the manner I have described. Of course, they are removable. The pity is that most of them are permanently removable, with one or both of the abutments, in from eighteen to twenty-four months.

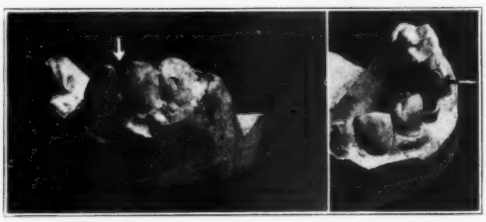

Fig. 12.—Casts made by dentists in preparation for porcelain jacket crowns.

But this is not all, and perhaps not the worst. Of the preparations sent to laboratories, fully half are such as no demonstrator in a dental college should accept from a freshman student. If the laboratories did not take a chance on their ability to guess what the dentist didn't tell them, they would have to reject fully half of the business that is offered them.

In Figure 1, the impression on the left was obviously so imperfect that the laboratory returned it with the statement that a denture made over it would be a failure. The dentist took the second

impression (right) under vehement protest. It is so short vertically in the buccal area within the white bracket that the denture will be easily dislodged.

It is, of course, impossible to articulate anatomically an upper against a lower cast so imperfectly defined as that shown in Figure 2. The masticatory efficiency so necessary to the patient's physical welfare is impossible with work like this.

A preliminary impression carefully taken in compound is shown in Figure 3. The plaster wash is not in contact with the palate in the shaded area. The dentist protested violently when the laboratory said it could not make a satisfactory denture from such an impression.

The laboratory returned to the dentist the impression on the left in Figure 4 as defective in the palate and deficient buccally. Under protest, the dentist took the impression on the right, which is also deficient in both respects.

Dentists sent the impressions shown in Figure 5 with orders for gold partial dentures covering the full palate. There was no impression of the palate in the shaded areas. The definition around the molars was very inaccurate.

When the laboratory explained that the lingual area to which the bar must conform had been distorted in the impression on the left in Figure 6 and that the impression was too short posteriorly, the dentist took the impression on the right with better lingual definition, but it also is much too short to permit satisfactory service from the denture.

If the posterior ends of lower partial dentures are to be tissue-borne, the impression should extend far enough backward to include tissue capable of such support without damage or rapid resorption. The laboratory explained this to the dentist, who took a second impression, practically identical with the first. (Fig. 7.)

Figure 8 shows the cast supplied by the dentist against which the partial lower shown as *B-1,* Figure 7, was to be occluded. How can anteroposterior relations of the two casts be accurately determined from the incisor and bicuspid region of this cast?

To lower cost and increase profit, the dentist declined to pay for a gold bar of sufficient strength in the denture shown in Figure 9. The denture bends in use and causes discomfort. The laboratory called attention to the fact that the impression included some of the cheek. The dentist replied, "I'll take care of that," but failed to do so.

Many failures of tooth-borne partial dentures result from lack of preparation of teeth to permit sufficient strength in the gold occlusal supports. The teeth to which the arrows point in Figure 10 are not prepared to allow for sufficient thickness of gold in these supports.

The dentist sent the cast shown in Figure 11 to a laboratory with an order to make a porcelain veneer bridge complete in one operation. The root preparation of the lateral incisor is very poorly defined. The remaining natural central incisor is merely a bubble in the cast. Intelligent construction is impossible.

The preparation on the left in Figure 12 leaves no room for porcelain between the central and the lateral incisor. In the preparation on the right, the labial surface of the amalgam die is so prominent buccally that the porcelain jacket will be far out of line with the other teeth.

CONCLUSION

We should not do the things that have been illustrated and described for at least three reasons:

1. Every time we do them, we lower the standing of dentistry as a profession, in the public mind; we strike a blow at the welfare of every other dentist, and

we set the seal of ultimate failure on our own life work.

2. It is almost impossible for the dentist who has made money by profiteering or racketeering to set his feet again in the pathway of continuous study and hard work, which is the only road to professional advancement. Furthermore, he gains, in the end, far less than he expects. Observation seems to show that too great concentration on money-making usually ends in the loss of the power to make money.

3. The public is becoming more interested in health than some of us realize. Our societies are planning campaigns of public education. I am undertaking such a campaign over the radio in the metropolitan district, in which live 10,000,000 people and 10,000 dentists. The most serious objection to such a campaign is that not more than half of the dentists are capable of rendering professional service when the public seeks it.

On the other hand, a dental diploma ought to be a badge of honor and a dental license ought to be a certificate of competence and character. They are written permission for continuous study, hard work and honest service. They ought to go far to insure esteem by the public of the practitioner as a professional man, a comfortable living and a chance for a competency. The more the public learns, the surer will be the rewards for merit and the more unfailing the penalties for incompetence and dishonesty.

220 West Forty-Second Street.

PHYSIOLOGIC AND PATHOLOGIC STATUS OF IMPACTED AND UNERUPTED TEETH*

By CARL D. LUCAS, D.D.S., F.A.C.D., Los Angeles, Calif.

An impacted unerupted tooth is a functionless organ which is in malposition in the maxillae or mandible at an anterior, posterior buccal, labial or lingual angle to the long axis of the approximating tooth of its supporting dental arch.

An impacted tooth is an unerupted tooth which is out of occlusal relationship to its normally opposing tooth and in malalinement with its approximating tooth. It may be entirely unerupted, having no intra-oral exposure, or partially erupted. A supernumerary tooth may or may not be impacted against its approximating neighbors, and may be unerupted or partially erupted or entirely so in its coronal aspect.

Such malposition of the teeth in the dental arches is the result of lack of longitudinal growth and development of the supporting jaws, with consequent spacing for the eruption of the permanent teeth disproportionate to the mesiodistal increment of the permanent teeth over that of the deciduous. Lack of growth and development of the jaws may be due to heredity or to lack of function of the anterior lobe of the pituitary gland which represents an endocrine deficiency in that a sufficient amount of its growth hormone to insure proper growth of the skeletal structures is not produced.

Since impacted and unerupted teeth are

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organs which are devoid of physiologic function, they are identical to foreign bodies in the tissues. Normal tissues do not tolerate foreign bodies without reaction, characterized by inflammation of a type which promotes their exfoliation. Since unerupted teeth are not exfoliated, their supporting tissues are chronically inflamed; hence, the sites of such malposed teeth are foci of deranged physiologic function.

THE ENAMEL ORGAN

The enamel organ is composed solely of epithelial cells; hence, it is classed as an ectodermal tissue, and is the formative organ of enamel. It is composed of polymorphic epithelial cells which generate from the primitive tooth band as tooth buds. The external epithelial layer covers the surface. The stellate reticulum comprises the bulk of the organ, the internal epithelium, which ultimately assumes the ameloblastic function, and the stratum intermedium, which lies between the stellate reticulum and the internal epithelium. Through metamorphosis and mutation, the cells of the internal epithelium are transformed into ameloblastic cells, which, by secretion of calcic salts, calcify bodily into enamel prisms or rods. Calcic salts are absorbed from the vascular system and are retained intracellularly until the columnar cells of the internal epithelium are completely calcified into enamel prisms. Enamel calcification is therefore a secretory process; while dentin formation is primarily a secretory process activated by the odontoblasts. Laterally, an excretory activity of the odontoblasts, through their tubular processes, results in dentin-forming calcic salts being deposited centrifugally about the protoplasmic processes of the odontoblasts, forming dentinal tubules which *in vitro* are filled with protoplasmic projections from the cytoplasm of the odontoblasts. Dentin formation is therefore an excretory process.

The ends of the ameloblastic cells of closest proximity to the dentin papilla become impregnated with calcic salts and calcification of enamel proceeds from within outward. The dentin papilla in juxtaposition to the internal epithelium of the enamel organ undergoes cellular metamorphosis and the closest approximating cells of the dentin papilla become odontoblastic or dentin-forming cells. Odontoblasts secrete calcic salts into their cytoplasm, and these salts are, in turn, excreted circumferentially about the protoplasmic processes of the odontoblasts, forming dentinal tubules. Dentin formation precedes enamel formation, and the dentin, which immediately encloses the horns of the pulp at the centers of calcification, establishes bases for the enamel prisms at centers of calcification and the

Fig. 1 (Case 1).—Upper left unerupted third molar.

Fig. 2 (Case 1).—Lower left partially erupted third molar; distal coronal area of acutely infected remnant of enamel organ.

junction of these two calcific processes becomes the dentino-enamel junction of crowns of teeth. After metamorphosis of the cells of the internal epithelium of the enamel organ, and after amelification has been assumed by these cells, the cells of the stratum intermedium which were embryonically polymorphous, undergo metamorphosis into cells identical morphologically to the original epithelium cells. These recruits assume ameloblastic function and calcify into enamel prisms, which fill the interstices between the original layer of ameloblasts resting upon the dentin cap at the dentino-enamel junction, and thereby increasing, in a compensatory manner, the diameter of the forming enamel cap at its angles. Cells of the stellate reticulum in closest proximity to those of the original stratum intermedium assume a similar metamorphosis and recruit the cells of the former stratum intermedium which have changed to ameloblasts. This process of metamorphosis continues until the enamel cap has been completed, at a time when the tooth root has been calcified to a point approximately 2 mm. beyond the cervical line, dentin formation constantly preceding enamel formation. Dentin formation proceeds from without inward.

Fig. 3 (Case 1).—Upper right unerupted third molar (no intra-oral exposure).

Fig. 4 (Case 1).—Lower right impacted unerupted third molar; large mesiocoronal area of infection plus infection within remnant of enamel organ.

ARRESTED PHYSIOLOGIC FUNCTION

After the crown of a calcifying tooth has been completed, the enamel organ has finished its physiologic functional activity. When the tooth erupts, the remnant of the functionless enamel organ is precipitated upon the surface of the crown of the erupted tooth, becomes pigmentated and is called Nasmyth's membrane. Incision and mastication of food and the use of the toothbrush mechanically abrade Nasmyth's membrane from the surfaces of erupted teeth. Persons who fail to observe mouth hygiene in their youth retain a portion of Nasmyth's membrane at the necks of the teeth; which is evidenced clinically by a green-stained film at the gingival margins of neglected teeth. This pigmentated, organic film, with its absorbed mucous plaques and food detritus, impregnated with saphrophytic nonpathogenic mouth flora, disintegrates ferments, produces acids which etch the enamel surfaces and finally results in early cervical caries.

Lack of growth and development of the jaws prevents eruption of teeth in normal position and their crowns become impacted against approximating teeth. If growth is not stimulated by either endocrine therapy or orthodontic technic, preferably by both measures, such malposed, impacted teeth are classed as unerupted teeth, if completely imbedded in bone or within their crypts, and covered with mucoperiosteum. Enamel organs of

unerupted teeth continue to receive nourishment by osmosis from nutrient vessels of surrounding tissues, but after the normal length and circumference of the crowns have been established, amelification ceases. Thereafter, the enamel organ becomes a remnant of physiologically and embryologically functionless tissue, which, on account of dysfunction, becomes a foreign protein, acts as a chronic irritant to surrounding tissues and produces a localized inflammation, a focus of chronic inflammation being thereby established.

Inflamed tissue is the tissue of choice for localization of infection from the blood stream in bacteremic conditions. Since no individual may escape the incidence of bacteremic conditions from such foci as teeth, tonsils, sinuses, appendix, gall-bladder and colon, each individual blood stream intermittently becomes a vehicle for transporting micro-organisms through all body tissues, bathing each tissue with a vascular supply, which is, at times of acute disease syndromes, contaminated with the attenuated germs of potential pathogenicity. Germs of attenuated virulence circulating through inflamed tissues localize in such congested, fertile fields, develop and reproduce their kind, and, in such a field, germs of low virulence, thriving in a perfect pabulum, increase in virulence in the focus of infection which has been established through metastasis. Virulence is determined by rapidity of growth and toxicity is determined by results of animal inoculation in morbidity and mortality ratios. The remnant of the enamel organ, which receives nourishment from the circulation of the surrounding tissues, is maintained at normal body temperature and contains moisture and nourishment which are ideal for germ growth and reproduction, being therefore a perfect incubator. Germs and their toxins are carried away from their focal habitat by lymphatics and veins, thrown into the general circulation and afforded an opportunity to localize in some organ or tissue which may chance to have low physical resistance owing to an inflammatory reaction incident to trauma, as of a joint; inherent low vitality such as is found in myocardial degeneration; kidney change due to inherited low renal resistance, or functional disturbance in some organ becoming involved with degenerative change through hematogenous distribution of bacteria from within the remnant of the enamel organ of an unerupted completely calcified tooth. Organisms in chronic foci develop an affinity for various tissues of the body as demonstrated by intravenous inoculation of animals with freshly isolated organisms from infected tissues and from the foci of infection in patients suffering from va-

Fig. 5 (Case 1).—Large mesioclusal gold inlay in lower right second molar, with no evidence of periapical disturbance; roentgenographically negative to periapical infection.

Fig. 6 (Case 2).—Upper left third molar, extracted because of loss of function from removal of lower left partially erupted third molar.

rious diseases. Such inoculations produce in animals lesions identical to those from which the patient is suffering.

During cycles of low resistance of the host of unerupted teeth, the virulence of the germs inclosed in remnants of enamel organs increases and, at such times, an acute abscess may develop within the crypts, characterized by cardinal symptoms of acute inflammation, heat, redness, pain, swelling and impaired function. Resolution may take place without pus formation, but such an acute inflammation usually results in suppuration, partial trismus of the masseter, internal pterygoid and buccinator muscles, cellulitis and physical symptoms such as arise in fever, rapidity of the pulse and general debility. This syndrome is not the usual sequel to infection within remnants of enamel organs of completely unerupted teeth having no intra-oral exposure. Such teeth may remain *in situ* for years, their presence causing no acute symptoms; to be discovered only by the roentgenogram; but they have been proved to be carriers of subacute pathogenic infection by cultures in more than 600 investigations of individual cases. In each case, investigated operations for removal of the unerupted teeth were made under the most strict rules of osteoplastic surgical technic and all cultures were planted in an anaerobic culture medium. Streptococci, usually of the viridans type, but occasionally hemolytic, were recovered in cultures and the streptococci proved to be pathogenic by animal inoculation, in many cases, by production in the animals injected of anatomic lesions that were identical to the lesions from which the patients were suffering.

The presence of impacted unerupted teeth has been proved etiologic of various types of psychopathic phenomena of varying intensity from melancholia agitata to dementia praecox, epilepsy having been frequently entirely relieved by their removal. Chronic irritation to nerve trunks or terminals may result through inherent tendencies to erupt. When these teeth are imbedded in crypts in a position which prevents eruption, the phenomena of eruption, although jeopardized, remain active. Since, for each and every action, there must be a reaction, the reaction produced through impending forces to eruption produces a chronic inflammation of the nerves in the vicinity through compression of nerve tissues due to localized inflammation. The resultant neuritis of regional nerves is reflected centripetally to the gasserian ganglion. If the ganglion is capable of absorbing all of the reflex nervous stimuli, the patient may suffer no psychopathic symptoms; but if the ganglion is incapable of absorbing such insults, the patient will suffer psychopathic sequelae as a result of irritation passing

Fig. 7 (Case 2).—Upper right third molar, extracted because of loss of function from removal of lower right partially erupted third molar.

Fig. 8 (Case 2).—Lower right partially erupted third molar.

through the ganglion to the base of the brain.

Since cultures from all unerupted teeth which have no intra-oral exposure, whether impacted or supernumerary, have been found to be positive, and animal inoculations in many cases have proved these infections to be pathogenic; and since many psychopathic syndromes have been permanently relieved by their removal, we are inclined to conclude that all impacted, unerupted and supernumerary teeth, which are necessarily environmentally functionless organs, should be removed, together with the entire remnant of their enamel organs, as a preventive measure. The remnant of the

Fig. 9 (Case 2).—Lower left partially erupted third molar. An acute suppurative infection was treated before the third molar was removed.

enamel organ, which is an ectodermic or epithelial tissue, must be removed at operation to prevent development of a cyst within the tooth crypt.

Osteoplastic surgical technic should be observed in each operation for the removal of these teeth, precluding the introduction of extraneous infection into a wound which is primarily infected and in a receptive condition for further bacteriologic invasion; which may result in serious postoperative complications, such as osteomyelitis or even septicemia.

REPORT OF CASES

Case I.—C. P. W., aged 24, mother of a 5 weeks old baby, came in June 24, 1931, after complete loss of vision of the right eye. There was no pain nor discomfort. Roentgenograms revealed unerupted impacted upper right and lower right third molars having no intra-oral communication; also an upper and a lower left partially erupted third molar.

June 24, the lower right third molar was resected and the remnant of its enamel organ carefully curetted from its crypt and planted in an anaerobic culture medium. Gram stained smears from the base of the tube showed streptococci. Blood agar transplants on incubation showed *Streptococcus viridans* and *Streptococcus hemolyticus*.

Fig. 10 (Case 2).—Lower left third molar socket, twelve days after removal of partially erupted lower left third molar.

June 29, the upper right and the upper and lower left partially erupted molars were removed and the remnants of their enamel organs cultured. Smears from these cultures showed streptococci and a gram-negative bacillus. Transplants on blood agar showed *Streptococcus viridans* and *Bacterium coli-communis*.

July 3, the patient could read the headlines of a newspaper with the left eye closed and soon thereafter was able to read equally well with the other eye.

February 10, 1932, the vision of the right eye again became impaired. The right side of the body and hip, the back of the right leg and the right foot were numb.

February 15, the patient could not distinguish daylight from darkness with the left eye closed. Complete roentgenographic checkup revealed no periapical involvement of any of the remaining twenty-eight teeth. The faradic pulp tester revealed a positive reaction to vitality in each tooth, but the lower right second molar, which contained a large mesioclusal gold inlay gave slight response to the full current. The roentgenogram did not indicate pulp recession with secondary dentin formation; therefore, a diagnosis of a partially inert and degenerating pulp in at least one of the canals was made.

Fig. 11 (Case 3).—*a*, upper right unerupted impacted third molar. *f*, *b*, *c*, *d*, scars in skull showing trephined areas. *e*, lower right unerupted impacted third molar.

On February 15, under strict rules of surgical technic, the tooth was removed and the socket curetted and sterilized with phenol and alcohol. The tooth was dipped in alcohol, the alcohol burned off and the tooth wrapped in sterile gauze and cracked open. The pulp was found to be injected with blotches of dark blood, and therefore devoid of normal circulation owing to partial stasis. The pulp was placed in an anaerobic culture medium and incubated for forty-eight hours. A gram-stained smear from the base of the tube showed a very fine gram-negative bacillus, a coccus and a diplococcus. Blood-agar transplants showed the organisms to be a gram-negative coccus, *Micrococcus catarrhalis*, a gram-negative bacillus and a gram-negative diplococcus. The gram-negative coccus and diplococcus are nonpathogenic, while the gram-negative bacillus is pathogenic and was probably etiologic in a recurrent retinitis. The toxins from the nonpathogenic organisms could

have been contributory to a toxemia which could cause dysfunction of the depleted organ.

February 17, the patient could see fingers at 3 feet with the right eye.

April 2, she could read equally well with each eye. No therapeutic treatment was used in either eye. The involved molar had ached slightly for a few days prior to loss of vision and was slightly sensitive to percussion. No further impairment of vision has occurred to date.

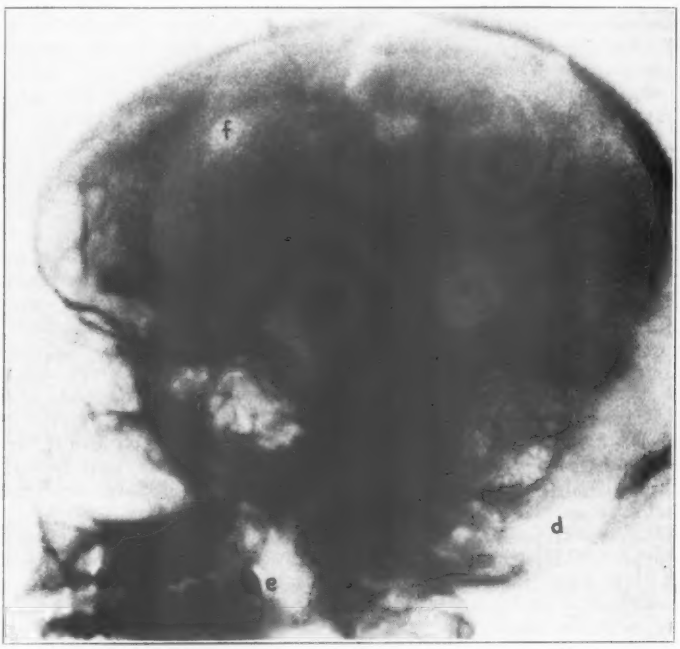

Fig. 12 (Case 3).—*a*, upper left unerupted impacted third molar. *f*, *b*, *c*, *d*, scars in skull showing trephined areas. *e*, lower left unerupted impacted third molar.

CASE 2.—W. B., a boy, aged 18, during spring football practice in 1929 sustained an injury to his shoulders and spine which necessitated hospitalization. Great pain was experienced, and numbness of the left arm and hand developed within two weeks. Numbness continued until December, when the patient consulted an eminent neurologist, who roentgenographed the spine and made a spinal puncture, determining the spinal fluid pressure to be normal. Numbness continued and a lack of growth and development of the left arm and hand was noted, with constant and severe pain in the back and shoulders. Loss of function, numbness, arrest of growth and development of the arm and hand and other neurologic symptoms led to a diagnosis of syringomyelia, or an infection of the central canal of the spinal cord, a condition ultimately resulting in atrophy, complete loss of function, paralysis of the sphinctor muscles of the rectum and bladder, incontinence of feces and urine and death within two years.

December 9, oral examination disclosed suppuration about the crown of the lower left, partially unerupted, third molar. After

treatment to relieve the acute symptoms, December 14, the tooth was removed. Strict rules of surgical asepsis were observed in the operation, and a portion of the remnant of the enamel organ from the most dependent portion of the crypt was planted in an anaerobic culture medium and incubated forty-eight hours. Streptococci and staphylococci were obtained. A transplant from the base of the tube to a blood-agar plate was gram stained and showed *Streptococcus viridans* and *Staphylococcus albus.*

December 24, the boy was free from back and shoulder pains; sensation was noted in the left arm and hand; mental depression was less evident, and the general physical condition was greatly improved.

June 12, 1930, the lower right partially unerupted third molar was removed. A culture from the most dependent portion of the remnant of the enamel organ was incubated and the deep growth from the culture transplanted to blood-agar and incubated and the colonies were gram stained. *Streptococcus viridans* and *Staphylococcus albus* were identified. The shoulder, arm, hand and spinal symptoms recurred in a mild degree, but subsided within three days.

March 26, 1932, the boy's condition was excellent. His arm and hand were developing normally. No shoulder nor spinal symptoms had been noted for months and he was cheerful and greatly improved. Relief of oral infection, observance of a careful dietetic regime, properly supervised exercise and careful observance of elimination apparently disproved a faulty neurologic diagnosis of a fatal disease attended by hideous sequelae which, just prior to death, affect the mentality.

(In our series of cultures from impacted unerupted and supernumerary teeth and from periapical tissues of pulpless teeth, when *Streptococcus hemolyticus* has been found, eye lesions were always noted.)

CASE 3.—L. H., a girl, aged 17, had been suffering paroxysms of a jacksonian type of epilepsy since she was 9 years of age. Spastic contractions of various groups of muscles occurred at frequent intervals, although consciousness was retained. The diagnosis was jacksonian epilepsy, induced by disease of the cortex of the brain, due to external hydrocephalis. Six decompression operations for relief of intra-cranial pressure relieved the epileptiform seizures for some time after each operation, the last operation in 1921 relieving the condition until January, 1929, when three severe convulsions occurred, the entire body being affected. Loss of consciousness occurred, a complication heretofore not encountered. Since March 12, 1929, many mild, spastic-tonic contractions of the right arm and hand and slight twitching of the left eyelid have occurred. Physical examination showed disks clear and sharp-edged. The lamina in the right eye could be seen more clearly than in the left. The pupils were equal, not dilated and reacted well and equally to light and in accommodation. Moderate lateral nystagmus was evident on looking to right. The teeth were apparently in good condition; the pharynx was of good color, and the neck was normal in contour. There was no adenopathy. The heart was normal in size, rate, rhythm and sounds, with no murmurs. The lungs were normal with good resonance. There were no deformities or edema. The right supinator muscle showed greater action than the left. The knee jerks were normal and equal. There were no plantar reflexes. The finger to nose test gave better results to the left. Sensation and power were normal. Oral roentgenograms disclosed four unerupted impacted third molars.

April 2, under ether anesthesia, the four third molars were removed with their respective remnants of enamel organs. Positive cultures from enamel organs were transplanted to blood agar, incubated and identified by gram staining as follows: upper left, upper right and lower third molars, *Streptococcus viridans* and *Staphylococcus aureus;* lower right third molar, *Streptococcus viridans* and *Staphylococcus albus.* Three very light convulsions occurred the week after surgical intervention, each convulsion diminishing in severity. The last, a very mild convulsion, occurred April 9. Since that date, the patient has been free from epileptic seizures. She has married, is the mother of a perfectly normal child and is in perfect health.

THE LEGISLATIVE PHASE OF THE "NEW DEAL" AS IT AFFECTS DENTISTRY*

By HOMER C. BROWN, D.D.S., F.A.C.D., Columbus, Ohio

"NEW DEAL" VERSUS "OLD ORDER"

THE so-called "New Deal" is the positive antithesis of the "Old Order," which is generally credited as being a major factor in our economic breakdown. "Rugged individualism," one phase of the "Old Order," has contributed conspicuously to the progress of all ages, but as a result of some of the recent changes, its future influence is surrounded with uncertainty. One of the outstanding illustrations of the extreme ruthlessness of "rugged individualism" was seen when the ranking executive of a group of utility corporations exacted annual salaries approximating $480,000 for the last two years of his regime, when these corporations were near collapse. Other striking examples of the rugged individualist are the international bankers and capitalistic groups who exploited a propagandized public to satisfy their own personal greed, a complete loss of the savings of millions of families resulting.

Supplementing these facts are statistics furnishing the surprising information that in 1927 there were ten persons with incomes of over $5,000,000; 273 with incomes between $1,000,000 and $5,000,000, and 10,784 with incomes between $100,000 and $1,000,000. This makes a total of 11,067 with an aggregate income in excess of $2,800,000,000, while the total cost of local, state and federal governmental activities was approximately $6,000,000,000. Further, I have seen statistics indicating that one-thirtieth of 1 per cent of our population own one-half of the Nation's wealth. All of this very definitely indicates the desirability of some readjustments.

Regardless of the high approbation accorded some of the former practices and irrespective of the views that any one may have had or now entertain, it should be apparent to all that a complete reversal of the "Old Order" has met with the approval of our citizenship. These changes are evolutionary rather than revolutionary, and there is nothing so radical in either the old or the new order that it becomes necessary to sacrifice the fundamental principles of individual initiative.

PROGRAM FOR SOCIAL SECURITY

One commendable phase of the "New Deal" is the proposal to establish social justice and security for all the people in contrast with the policy of granting special privileges to limited groups, and it is interesting to note that a general program of readjustments for practically every line of endeavor is receiving consideration. Evidences of this are rapidly accumulating from various sources. For instance, a Washington news item appeared in the press of November 11 under the caption of "Ten Point Social Security Program Being Formulated," the items being listed as follows:

*Read at a meeting of the Ohio State Dental Society, Columbus, Nov. 19, 1934.

Unemployment insurance.

Provisions for old age security.

Provisions for meeting the economic risks of illness.

Public works as a means of economic security.

Employment opportunities.

Special measures for economic security of children.

Surviver's insurance.

Dependency and relief.

Economic security for farmers and agricultural workers.

Handling and investment of reserve funds.

A conference of various groups interested in this security program was held in Washington, November 14, and, from press reports, it appears that the President approved only the first item, that of "unemployment insurance." The press release referred to the immediate objective of the program and quoted the President as advocating:

Unemployment insurance of a cooperative federal-state form; the funds to be held and invested by the federal government, the benefits to be administered by the states.

Enactment of state laws to carry out such a program.

An effort to bring the persons now on relief rolls back into productive employment and thereby put them under the insurance system.

For a long range program, he proposed:

A uniform system to provide security for the aged.

A method, perhaps through insurance, for providing against the economic loss due to sickness.

He said further:

In developing each component part of the broad program for economic security, we must not lose sight of the fact that there can be no security for the individual in the midst of general insecurity.

Our first task is to get the economic system to function so that there will be a greater general security. Everything that we do with intent to increase the security of the individual will, I am confident, be a stimulus to recovery.

At this time, we are deciding on long-time objectives. We are developing a plan of administration into which can be fitted the various parts of the security program when it is timely to do so. We cannot work miracles or solve all the problems at once.

What we can do is to lay a sound foundation on which we can build a structure to give a greater measure of safety and happiness to the individual than any we have ever known.

Dr. Casto, President of the American Dental Association, attended this conference and in all probability he will refer to some of the developments in his address tonight.

My interpretation of the limitations placed on this social security program by President Roosevelt is that they will have a tendency to retard the progress of some of the health insurance proposals, but later news dispatches clearly indicate that the advisory committee of twenty members hopes to secure presidential approval of some additional items. The emergency is acute and no delay in developing the policy of the American Dental Association should be sanctioned.

SOCIAL JUSTICE AND REFORM

Supplementing these plans, Father Coughlin, of Royal Oak, Mich., delivered a radio address November 11, announcing the formation of an organization to be known as "The National Union for Social Justice," with a sixteen point program. One hour later, the Rev. Mr. James H. Gillis, of the Council of Churches, outlined a program of "social reform" in a radio address; and articles and editorials of this nature are continually appearing in the daily press, the popular magazines and professional periodicals, especially in medical and dental journals.

EDITORIALS AND OTHER COMMENTS

In addition to the articles appearing in many of the dental journals, discussing some phases of this question, there are some excellent editorials. Also, an editorial appears in the November 10 issue of the *Journal of the American Medical Association* under the heading "Committee on Economic Security," which presents a review of this proposal. Further, a very illuminating editorial appears in the November issue of the *Dental Cosmos,* entitled "Health Security for the Public," from which I quote the following:

The first signs of the trend of thought in this direction were evidenced some five years ago, when the governmental authorities sponsored and indirectly supported a survey of the medical facilities of the country in an effort to determine the reasons for the high cost of medical service. The Final Report of the Committee on the Costs of Medical Care, which marked the culmination of the first semi-governmental step in this direction, while it did not eventuate in the adoption of any specific plan of public health service, did definitely direct the trend of thought of the public toward some sort of socialized health service. And now we believe we are witnessing a crystallization of that thought which will inevitably lead to the establishment of some plan of health service that will be coordinated with the broader plan for economic security of the nation that is definitely within the purview of the present administration.

In the meantime the general attitude of the medical profession on the whole has been one of indifference and, in some sections of this country, one of antagonism. The attitude of the dental profession, while it has not been antagonistic, has been noticeably indifferent, with a tendency to follow the reaction of the medical profession.

Regardless of his political beliefs or social affiliations, every thinking man must have realized in the past few years the inadequacy of both medicine and dentistry in rendering health service to all classes of people. And the welfare organizations have realized it more than the man on the street, particularly in regard to the health service that has been available to the salaried class and to the higher level of wage earners.

Several editorials, relating to certain phases of this question, have appeared in THE JOURNAL, and I incorporate herein a paragraph from the address of Dr. Johnson at the formal dedication of the new dental school building of the Indiana University:

The principles and policies of education of all kinds are undergoing an evolution that in some respects is significant of the changing concepts that we see going on in our entire social order. All change is not necessarily good, but that change is essential to healthy growth there can be no question. If we study the trend of events since the beginning of history we must be impressed with the fact that all progress means change, and we should accept with gratitude the fact that in the majority of cases the various changes have resulted in the betterment of mankind.

As an evidence of the interest of the Ohio State Medical Association in this problem, the following paragraph is quoted from an editorial in the November, 1934, issue of the *Ohio State Medical Journal,* under the caption "Social Medicine Programs Imminent":

If recent developments bearing directly on scientific medicine and medical practice have been interpreted correctly, there is no doubt but the coming months will be fateful ones for the medical profession and challenge every ounce of strength, initiative and courage it will be able to muster through the facilities of medical organization.

The following is quoted from an article in the October, 1934, issue of the *Illinois Dental Journal,* by R. G. Leland, director of the Bureau of Medical Economics of the American Medical Association:

It seems to me that during these times

there has been a very marked interest in the economic phase of professional service; and if we shall have developed a sound, genuine, honest interest, then these disturbances shall not have been entirely in vain. There must be, during these times, an increase in the organized effort of medical and dental associations, both state, local and national, an increase in the collection of accurate dependable data, with which to combat many of the annoying influences represented by all these propagandizing foundations and other conditions seeking to control the professional services. . . .

Now if we approach the study of medical and dental economic problems with minds that are divorced from all of these uncertainties, all of these things which warp our conclusions, it seems to me that we will surely be able to make some progress, and make certain changes that we all believe are necessary.

AN ADEQUATE DISTRIBUTION OF HEALTH SERVICE

In the furthering of any of these proposals for social equity, it would seem that a more adequate distribution of health service will undoubtedly be an essential feature, since a healthy citizenship is generally considered the greatest asset of a community, state or nation. In support of this, there has been a strong and ever-increasing sentiment, both within and without the health professions, in support of certain equitable readjustments, that this important service, in its broadest sense, may be available to all.

WHITE HOUSE CONFERENCES

The need for an improved health service was recognized by Theodore Roosevelt, who inaugurated the White House Health Conference in 1909, and in 1919 President Wilson organized a similar conference. Again, in 1929, President Hoover inaugurated the White House Conference on Child Health and Protection, on a much larger scale than either of the previous ones, and in which every correlated phase was represented.

It was my privilege to serve on the Committee on Public Health Organization of the last White House Conference, the first meeting of which was held in the Cabinet Room, Nov. 7, 1929. In addressing the committee, President Hoover emphasized the benefits to be derived from such an undertaking and stated that it was just as much the responsibility of the federal and state governments to promote and protect the health of the youth as it was to assume responsibility for their education. This was a very positive statement, but probably most of us will admit that the importance of health even transcends that of education.

COMMITTEE ON THE COSTS OF MEDICAL CARE

Furthermore, in 1927, the Committee on the Costs of Medical Care was authorized as a semigovernmental activity to conduct a five-year study in all phases of the cost and distribution of health service. In submitting its final report, Nov. 29, 1932, there was some disagreement, which resulted in the presentation of a first and a second minority report, wherein certain dental representatives participated.

There is no question that the Committee on the Costs of Medical Care was the result of well-prepared and disseminated propaganda, and that the investigation was very largely conducted by those with a socialistic or semisocialistic bias. For instance, Dr. Nathan Sinai addressed the Ohio State Dental Society in December, 1931, on the following subject: "Social Insurance in Dental and Medical Care." At the close of his address, I sent the following note to the president of the society, Henry E. Germann:

Should not this group express itself in

favor of developing a constructive program of preparedness in order to oppose any plan relating to panel or state dentistry gaining a foothold in the United States?

Dr. Germann read this and passed it to Dr. Sinai, who replied on the reverse side, as follows:

Yes, if the profession is *sure* that panel or *state* dentistry is not a solution and can offer a better one.

This, to me, clearly indicated that Dr. Sinai was convinced that some type of socialized dentistry was the solution of this problem, and it will be recalled that the American Dental Association was not invited to cooperate at the time this survey was inaugurated, but later was asked to contribute in order to carry this work to completion. As a result, from 1929 to 1932, the Association contributed $32,035.42, and, in addition, the American College of Dentists contributed $15,000; a total dental expenditure of $47,035.42. In view of the results, some have expressed regret that this expenditure was not made in formulating a program which would render it possible to extend dental service to greatly increased numbers in some practical manner, especially for those in the low income brackets, rather than to assist in compiling data which may be used to refute the arguments of organized dentistry, if and when a question of this nature comes before state legislatures.

In addition, it is generally recognized that many of those actively associated in the studies on the costs of medical care had very definitely preconceived ideas before the survey was undertaken. In fact, there have been some strong accusations made in this connection. In view of this fact, it is suggested that if any further studies are necessary, they be directed by persons who represent the concepts of the organized professions.

From the statistics of these and other activities, it is indicated that less than 50 per cent of the public are receiving medical care and only approximately 20 per cent are receiving any dental care, other than emergency treatment for the relief of pain. During the same period, other organizations, supported by unlimited funds, have been devising plans to provide a more extended service and, regardless of the five years of economic stress, there is no question that some necessary readjustments would have been formulated in due course of time, but, as a result of the depression, and the need for correcting other inconsistencies, it has stimulated those directly interested in health service, of which dental treatment is a well-recognized integral part, to an increased activity, until we are now face to face with the most serious question that has ever confronted dentistry and the allied professions.

PROPOSED HEALTH INSURANCE LEGISLATION

In support of this humanitarian service, the Milbank Memorial Fund has compiled unlimited statistics, prepared by able investigators. A large amount of money has been expended in assembling their data, and it has been generally reported that this would result in some form of a model health bill being introduced in all the state legislatures meeting in 1935. Supplementing this project, the American Association for Social Security compiled similar information and prepared a tentative health insurance bill for similar introduction. A hearing on this tentative draft was held in New York, October 27, at which time the following members of the American Dental Association were present, but not in their official capacities: John T. Hanks, Alfred Walker, Kenneth C. Pruden and I. Two other dentists and a number of physicians,

social and welfare workers and others were present.

The purpose of this meeting was to secure the unofficial views of those present prior to the redrafting of the bill in an effort to have it better meet the general situation. It was definitely stated that the presence or observations of our representatives could not in any way be interpreted as representing the views of the American Dental Association, and, during the discussion, it was stated several times and generally understood that the purpose of this legislative proposal was not to socialize health service, but rather to avoid such a drastic procedure. There were some present who urged the socialization of all health services, and one Brooklyn physician stated that there was an organization of 1,000 physicians in greater New York in favor of and actively working to bring this about. I inquired as to the number of physicians in this same territory and he estimated that there were approximately 16,000. This prompted me to state that this was only one out of sixteen, whereupon he replied that his group was organized and enthusiastically engaged in furthering socialized medicine, while only a small percentage of the others had been aroused to the seriousness of the situation; which reminds me that much of all legislation is dominated by well-organized active minorities.

Some have questioned the propriety of members of the American Dental Association being in attendance at the hearing. The authority for the presence of the two members of the Legislative Committee was from Dr. Casto and Dr. Robinson, chairman of the committee, and the request to attend the hearing was only received the day before it was necessary to leave for New York. In view of this and our recognized limitations, the following letter was written to Dr. Casto just before I left, copies being sent to the other executive officers and members of the Committee on Legislation:

October 26, 1934.

Dr. Frank M. Casto, President,
American Dental Association,
Cleveland, Ohio.

My dear Doctor Casto:

I am leaving the office in just a few minutes for the Hearing in New York, and fully appreciate the fact that our authority is limited. However, the action of the House of Delegates on Thursday afternoon, as found on pages 10 and 11 of the Minutes, presents a basis for most careful consideration and possible negotiations. In this connection I set forth my views of the situation as follows:

(1) The representatives of the American Dental Association are to act as "outposts" and secure all possible information connected with this proposal, especially that relating to the practice of dentistry.

(2) Without in any way attempting to obligate organized dentistry, an effort should be made to secure such modifications as will better safeguard the interests of the profession and those they serve.

(3) If dental service is to become a part of this Health Insurance Program, it would seem to be advisable to remove the limitations of service, as provided in the tentative draft, except restorations wherein precious metals are employed.

(4) We should insist that if legislation of this nature is to be introduced in the various State Legislatures, *dental representation* must be provided on the State Commission, rather than to provide for three physicians and no dentist. It is all right and proper to have the Commissioner a physician, as has been stipulated, and the Director of Health to be the second member, making two physicians. Next in order should be a dentist, followed by representatives of industry and labor.

(5) It would seem advisable to condense this Bill as much as possible and also to avoid creating any more Committees, Advisory Councils, etc., than is necessary to

provide for its proper functioning, if and when such legislation is enacted.

I received a wire from Dr. Hanks inviting me to have breakfast with him and others, and know we will all appreciate a wire from you, approving or disapproving what I have herein set forth as a policy, and any further suggestions you may have to offer.

With regards and best wishes, I remain,
Hastily and sincerely yours,
(Signed) HOMER C. BROWN.

The following wire was received from Dr. Casto:

Your suggested procedure meets with my approval. Regards to all.

Also, as per previous wire requests, letters from both Dr. Casto and Dr. Robinson were received on arrival at the hotel.

There was a general and free discussion on most of the provisions contained in the seventeen page tentative draft of this health insurance legislation, but no vote was taken on any of its provisions. Furthermore, the members of the American Dental Association were very particular to stress the fact that they did not wish their presence to be interpreted as approving this or any other similar legislation. In support of my statement, Dr. Casto, in a conference yesterday with Drs. Hanks and Walker and me, advised that, while in Washington the previous day, he had an opportunity to discuss this question with Herman A. Gray, who wrote the bill and acted as chairman of the committee, and Abraham Epstein, executive secretary of the American Association for Social Security. These men informed him that the members of the American Dental Association present at the hearing very definitely announced that they were not authorized to represent the Association officially and that neither of them construed our presence or participation in the discussions as indicative of personal approval. He also stated that the presence and suggestions of the dental representatives were received as most helpful and constructive.

IMPORTANCE TO ORGANIZED DENTISTRY OF FORMULATING A DEFINITE POLICY

While dental treatment is a recognized integral part of health service, there is a difference in its rendition as compared with medical treatment; that is, in much of the medical practice, patients are wholly incapacitated, while this is very rare in dental practice. Moreover, the sponsors for any type of health insurance will, of necessity, make adequate provision for medical, hospital and nursing care; but owing to the fact that dentistry has only recently been recognized as an essential part of health service, it is quite possible that it will not receive due consideration unless those directly interested insist that adequate recognition be incorporated, and this should be done during the drafting period of any legislative proposals. For that reason, it is absolutely necessary that the views of organized dentistry be presented in ample time that the dental point of view may be incorporated in any such legislative proposals. This should not be interpreted as approving health insurance; nor should it interfere with the organized professions in opposing such legislation; but it should be recognized as an alternative procedure in order to safeguard dentistry, if and when such legislation is introduced or enacted.

In view of existing conditions, the profession should be keenly alert that we may retain all the essential features of the progress heretofore achieved. On the other hand, we should not seek the impossible or demand the impractical, but should be prepared for such emergencies as may arise. It should be apparent to any close observer that the solution of this and some of our other perplexing

problems will demand a constructive and forward-looking policy, directed by our authorized officials. In spite of the reduced income of dentists, our membership should be greatly increased, and an appropriate slogan to meet this situation would be: "Every eligible dentist will be welcomed to organized dentistry as an asset and every nonmember classified as a potential professional and political liability." Thus, it becomes the duty of actively interested members to see that every eligible nonmember has this question so presented that he will fully evaluate the importance of society affiliation. Economically, a dentist should consider this a form of insurance on his most valuable asset.

Never in the history of organized dentistry has constructive cooperation been so essential in safeguarding our interests in political, governmental and legislative affairs, which are predestined to regulate, to a greater extent than ever before, many of our socio-economic problems. Therefore, it behooves us to become more interested in these correlated activities since constructive readjustmenst in most of our relationships are challenging the dental profession for an early solution.

The ambition to succeed, the visualizing of future opportunities for adequately administering to afflicted mankind, the urge to do and the desire to initiate and serve are all individual characteristics; and there is no logical reason for sacrificing any of these commendable attributes in observing the long established principles of the "Golden Rule." However, the day for the ease and comfort of the few, at the expense and suffering of the many, is very properly fast passing into oblivion. Fortunately, in each generation, there are those persons with vision and faith who assemble all the essential details in coordinating the forward-looking forces for advancing the struggle for human rights, and no fundamental principles, where such questions are involved, can perish, neither will they long be denied.

609 Hartman Building.

A CHINESE SKULL OF THE SECOND CENTURY

By J. L. BOOTS, D.D.S., M.S., F.A.C.D., Seoul, Korea

THE Asiatic peninsula of Korea offers rich possibilities today for archeologic study. Many hundreds of ancient tombs lie in places well-known, easy of access, in a country of peace and safety, awaiting only time and money to disclose their secrets.

The opening of these tombs is being carried on under the able direction of the Archeological Department of the Government General of Chosen. In the summer of 1933, tomb No. 127, near the city of Pyengyang, 150 miles north of the capital, provided one of the most valuable discoveries to date.

The tomb was one of the district of Nak Nang, which was settled by a large immigration from north China, and controlled by those people from 108 B.C. to 313 A.D. The date of this particular tomb is about 150 A.D. Such a transfer of civilization no doubt had a great influence on the people of Korea, and even of Japan.

The tomb, according to the excavators, Oba and Himoto, consisted of a buried

wooden beamed vault, containing two red lacquered wooden coffins. According to engraved wooden plates therein, the tomb was that of a provincial governor named Wang Kwang and his wife or concubine. The coffin containing the man's body was broken, and there were no remains inside except male artefacts. The other coffin was in excellent condition. The skeleton wrapped in red cloth and resting on straw was lying in water. There was a reddish yellow sediment, 2 or 3 inches thick. Several female artefacts accompanied the body. From the small size of the bones and the teeth, and from the articles found with this body,

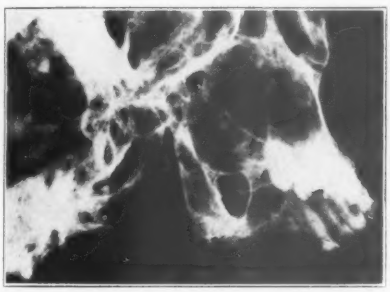

Fig. 1.—Chinese Skull of Second Century (Korea). The root canals in the last tooth seen on the left and the upper second bicuspid are radiolucent, while the canals of the two teeth anterior to it are radiopaque. The peculiar shadow at the left of the picture is caused by metallic deposits.

there is no doubt of its being that of a woman. From the ununited condition of the sutures, local authorities on anatomy have thought this person to have been between 30 and 40 years of age. The condition of the teeth seemed to me to indicate that she was more nearly 50 or 60. She was probably Chinese. The Korean and the Chinese people have had diets very much alike, and both have a low incidence of dental caries and much periodontoclasia.

The skeleton, which is in good condition, has been carefully examined and recorded by Dr. Imamura of the Anatomy Department of Keijo University. A more detailed report on the teeth will be of interest to dentists. Human remains are not commonly found in Korean grave sites and this is the only complete skeleton unearthed so far. In all the old skulls and teeth found, this is the only occurrence of dental caries. From the type of the tomb and the records therein, we may assume that we are studying the skull of one of the wealthy class who ate a richer

Fig. 2.—Appearance of upper central incisors and left cuspid.

and more varied diet than that of the common people of her time.

The skull was brown when found, but soon changed to coal black when brought out to the air. The enamel of the teeth is bluish white. At first glance, three interesting things are noted: heavy abrasion, periodontoclasia and approximal caries.

ABRASION

Abrasion on all the teeth may be termed third degree except that on the last tooth on the upper left, which is only

first degree. In the anterior teeth, the incisal surface is more than half gone, and the bite is edge to edge. The upper left central incisor is abraded to a dull spear-head shape. Abraded surfaces slope up slightly from the buccal-labial to the lingual aspect, back to the first molars, where they become level, except the upper left third molar. The lower right third molar is dipped mesially so that its distoclusal half is abraded more than the mesial half. The occlusal portion of the upper left first bicuspid is cupped toward the mesial aspect.

From this consideration of abrasion, we may assume that the bulk of the diet was, as it is today, grain, prepared in a simple stone mortar, so that small particles of stone are eaten with the food and act as an abrasive on the teeth. In several places, small pieces of the enamel margin are chipped out.

Fig. 3.—View of upper teeth in Chinese skull.

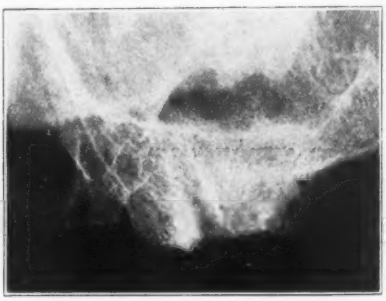

Fig. 4.—View of alveolar ridge.

PERIODONTOCLASIA

There is every evidence of marked periodontal disease. Sockets of some missing teeth have that typical pyorrhetic appearance. The lower central incisors are missing, and the other teeth have moved mesially to almost fill the space. The alveolar ridge is extremely thin here, and even with the crest of the lateral sockets, which are about half normal height. The sockets of the upper right second bicuspid and first molar are not distinguishable. The socket of the lower right second molar is large and round, and the septal bone is gone. The line of the sockets of the lower left bicuspids is discernible, but the buccal plate is entirely gone. The socket of the lower left first molar is filled in, and at the site of the lower left second molar there is only a slight depression (one quarter inch), and perhaps half that much in the position of the lower left third molar. The distal root of the upper left first molar is exposed, and the bifurcation may be seen. A slight space between the upper left cuspid and first bicuspid shows a pocket, exposing the deeply grooved mesial surface of the bicuspid. Lingual periodontoclasia is deepest at the upper left second and third molars, and there is a deep pocket between them. Several teeth have shifted mesiodistally, leaving spaces. There is contact only between the upper right incisors and cuspid; left first incisor and cuspid, and left cuspid and first bicuspid, and the lower right second incisor, cuspid and bicuspids.

It is probable that both upper first molars had been lost early in life, and the teeth shifted to fill the spaces. The upper

right first molar had certainly been lost some years before death. The space is there, but no socket remains. The upper right second bicuspid and first molar erupted out of the occlusal line into the space of the missing tooth or teeth above, but not before they were abraded. Therefore, we cannot know whether the upper molars were lost from pyorrhea or from caries, for they were not lost before the age of pyorrhea susceptibility. Very little calculus remains on the root surfaces.

CARIES

The absence of the upper right second bicuspid and first molar in the later years of life allowed the elevation of the lower right second bicuspid and first molar out of their sockets and the dipping of the lower right first molar distally. Hence, the contact between the bicuspid and the molar was lost, and the space of 2 mm. there formed a food pocket. At that place, there is normal approximal caries extending about one-third of the tooth diameter into the molar and a little less into the bicuspid. The occlusal surfaces are broken down to the limits of the caries extension. It is to be noted that this carious molar is the only tooth now tightly *in situ*.

OTHER ITEMS

The last tooth on the upper left has been reported as the upper left second molar, but on account of the comparatively low degree of abrasion and the decided buccal inclination, its single root, the presence of the lower third molars and the spacing of the teeth, I consider it without doubt to be the upper third molar, and not the second. The same is true on the opposite side, although the tooth has been lost since the skull was found. The roentgenogram discloses no teeth unerupted, and the sockets of these posterior upper teeth are at the extreme limit of the bone. There may be some doubt as to whether the first molars or the second molars were lost, but I think it more likely that the first molars were lost, and that the second molars, and later the third molars, moved forward to take up the space.

Further examination reveals the absence of the upper left lateral incisor. The crown of the abraded cuspid is small and difficult to tell from the lateral incisor, but roentgen-ray examination reveals the root of the tooth in the position of the lateral incisor to be that of a cuspid. Furthermore, the central incisor on that side has a shortened malformed tooth with a decided flexion toward the mesial aspect. It has shifted toward the distal aspect, and is in contact with the cuspid, leaving a space of 2 mm. between the central incisors. The palatal suture is in line with the mesial surface at the neck of the upper right central incisor. The labial plate of the alveolus over the malformed root has been destroyed. We may, therefore, assume that the individual suffered a blow in early childhood, a blow from above down at the left side of the nose. This accident happened at about the age of 7 years, and so injured the lateral incisor that it was removed from the wound or was sequestered before the normal time of eruption. The central incisor received less injury, or was so firmly established that it was able to continue its eruption, but the root formation from then on was in a new direction.

The roentgenogram reveals metallic deposits in the skull, and the interesting fact that, although most of the root canals are radiopaque, some are radiolucent.

A REVIEW OF THE YEAR

By NEWTON G. THOMAS, D.D.S., M.A., Chicago, Ill.

A YEAR is a long time, if the minutiae that made it are counted, but it is shortened if measured only by big events. In saying that only a few things were done and merely naming them to save space, it must not be forgotten that those few things called for anteceding years of work and the hands of an army for their culmination. History is written so. A small book may contain the events that we call important, but libraries would be needed for the ingredients that enter into their making. Four short years told the tale of the World War, but a hundred years of statecraftiness went into its cause and twenty centuries into the nationalism that fanned it. Appreciation of events reaches its highest altitude when we look into the laboratory from which they emerge. Back of the elements of this review are the thinking, the devotion, the labor of scores unnamed and unnoted. And those scores must not be forgotten.

The year 1933 saw dentistry put itself on display for the public eye at the Century of Progress. It joined with medicine, agriculture, mechanics, government to show itself to the world. The demonstration was the joint pride of the American Dental Association, the Chicago Centennial Dental Congress and the Chicago Dental Society. Millions were edified by the demonstrations and lectures. Dentistry suffered not a shade of disparity when compared with medicine, the physical sciences or transportation. There was evident genius in its arrangement, mechanization and art. The whole profession was exalted by the beauty, the completeness, the effectiveness of it. Schools, museums, libraries, business houses, individuals contributed of their rarities, antiques, trophies and treasures to give the exhibit the prestige it won. Dentistry old and new was portrayed, teeth natural and artificial, teeth in development and maturity, teeth in health and disease. Tribute to those who planned it, and maintained it, is not to be worded here. Obviously that cannot be done. An appreciation worthy of such work is beyond words. With the continuation of the Fair into 1934, the Dental Exhibit leaves a heritage of that year too. With the Century of Progress, the Century of Dental Progress shares honors and leaves a lasting lesson and inspiration for the millions who stopped to wonder and praise. That was its purpose, a purpose fulfilled.

Another feature that characterized the previous year and was carried into 1934 was the cumulative interest in economics —economics as it concerned the profession and economics as it concerned a dentistry-needy but unclaimed and only partially recognized proletariat. Scarcely a journal or bulletin in the field has been devoid of articles on the subject, some being ablaze with the enthusiasm of a new affection, some serious, fearful, questioning, some judicial, wise and profoundly worthy of attention. And, by the same token, there is at this moment scarcely a society without its committees appointed

to study the best ways and means to extend care to those in need of it, but who also are indigent; to extend care with due thought to the limitations of those who are to afford it, and to do it with dignity, without loss of personal or professional integrity. An old problem has taken on new elements and modifiers, the same newness making it infinitely more complex. The situation as it stands calls, not for a high enthusiasm so much as for profound sympathy and understanding, an unflagging interest and calm approach, but an approach.

In any great emergency, a *zeitgeist* is sure to develop. In this one, with millions in need of help of every sort, history repeats itself. The time spirit is care for the needy called by various terms. Fervor can easily flame on such a theme and folly too. The one should not be lacking; the other must be avoided. Human nature easily overpledges itself in its passionate moments, to regret it later. Recently, the A.D.A. announced that it "is opposed to the enactment of legislation along the lines of so-called compulsory health insurance until the health professions are thoroughly satisfied that the interests of the public and the professions are properly safeguarded." This is no retreat before embattled fact; it is rather a call to steadfastness, studious firmness in a seething swirl of changes. High moralistic attitudes can't be enforced by legislation. We have seen that tried and fail. Moral issues never submit to coercion. The certain path, any man may promise, is via education. Every community facing its own need and coping with it, learning by experience and improving by the day, is the surest way to prepare for emergency. That is progressive evolution and evolution is the basic law of life. Experience asks who can be trusted with the direction and distribution of widespread alms. Who can be trusted for loyalty to purpose, for wisdom in adjudication of need, services and funds in such a magnificent endeavor? Experience slows the step to a studious pace when proceeding to national or state managements and controls of the intimately human and intimately personal. By its written exhortations and by its committees, American dentistry proves that its heart is right. It must also prove that its thought is right. To quote a modern sage: "Love and intelligence are the greatest forces known to man." Either alone is impotent; together they are omnipotent.

MEMBERSHIP

During the past year, a deep interest has been stirred in increased membership. The A.D.A. Membership Plan had been approved, organized and set in motion. State after state set itself to increase its numbers and strength, and, month after month, bulletins and journals have reported additions. These have been added to the Association and many more JOURNALS have been going into the mails than a year ago. Desire for an increased membership is not based on a mere wish for self-aggrandizement: it is basically important. Membership is a basic issue for the Association. A prominent man said recently: "A weak membership may be a menace." He was speaking of the Association. He might as truly and more pointedly have spoken of the menace to persons, individuals. Objectives worthy of dentists, interests vital to them, are the reason for the Association's existence. The founders of dental and medical and legal associations all felt the sharp point of this need. They said: "To accomplish our desire, our objectives, our service, to expand our ministry we must organize. Also to protect ourselves, to give our activities weight and power." Hence, the Association. That body is every man's possession: the

A.D.A. is the service, the judgment, the wish of the individual in multiple. What citizens are to a nation, what soldiers are to defense, members are always to an association. If dentistry would fulfil its pledge, it must keep its hands strong. Not long ago, a state official referring to an appeal made by a committee said, "They represent less than half of the dentists of the state." Remove the cohesion of the organization and the individual swirls in the current of circumstance like a chip in a flood. Speaking personally, the dentist, member or nonmember, is stabilized, dignified, amplified by the Association whether he appreciates it or not. A drive for membership, although it has other features, is of the greatest interest to the person sought.

A new feature and an important one of the membership plan is the approach made to students in the dental schools and licentiates following graduation. The purposes of the Association and its Code of Ethics are presented to them while still in school and declaration blanks are provided for them which they fill optionally if they desire to become members as soon as they are licensed to practice. The connection necessary between school, the Central Office of the A.D.A. and the component society of which the graduate is to become a member is made. For some months, the number to be determined by the Board of Trustees of the A.D.A., the licentiate receives THE JOURNAL and is granted visitor's privileges to attend local and state meetings if he is not yet a member. Also, each state society is to be requested to supply him with the state bulletin and to provide that, to initially licensed dentists, the membership fee (if any) be cancelled, and the annual dues of the state society be remitted for the remainder of the year of the issue of the license, and the first year succeeding the year when the dentist was licensed. This would insure to the licentiate membership in the district component, state and national societies for four dollars as dues to the A.D.A. for the time specified.

During the past year, 4,000 new members have been added to the rolls of the A.D.A. A slight analysis of campaign results is at once illuminating and inspiring. There are fifty-nine associational membership groups. Of these, fifty exceed the preceding year; nine fall short of last year's quota, eight constituent groups have reached an all time high.

EDUCATION

In March, before the American Association of Dental Schools, the Curriculum Survey Committee reported its accomplishments to that date. How important to dental education the work of the committee will be may be stated by comparing it with the examination of dental schools by the Carnegie Foundation. The first had to do with organization, buildings, equipment, teaching, libraries and university relations. The second had more to do with the substance of the curriculum, the relation of its parts, the preparation of the student and the method of teaching. The report of the Survey Committee was not binding on the schools represented in the association, but cannot fail to have a profound influence on its activities, as each school supported the survey and most of them gave of their faculties to aid in clarifying the state of education prevailing in dentistry. Up to the time of the report, $30,000 had been appropriated for the survey; since then, $15,000 has been granted to further its work.

In an address, "Changes in Dental Education," A. R. McDowell summarizes the report of the Curriculum Survey Committee as follows: Two years of

preprofessional education in the liberal arts and sciences shall be required for admission to the dental school. Dental education shall be further developed as an autonomous field of professional education. The curriculum to be submitted by the Curriculum Survey Committee shall be adopted as a guide to the member schools of the association.

The time has been too short for radical realinements of curriculum, and, to date, schools are found operating on a 1-4 plan, a 2-3 plan, a 2-4 plan and a 3-4 plan. In a period of transition, some are operating on two plans at once. The outcome cannot be prophesied, but will doubtless become evident at a near date.

The year 1934 shows a variation in the first year enrollments in different schools, with a total lower than any recorded for seven years except 1932-1933. This lessening has not been analyzed. The enrollment for medical schools has increased. It has been suggested that the raised entrance requirements might explain it. With the required credits for entrance to dental schools so high, a student may easily enter the medical field and have a wider range of specialties to select from.[1]

RESEARCH

It has been said that dental research has been slow to apply new research methods, technic and discoveries in other fields of service. This is not true. Probably the most significant recent accomplishment in dental research has to do with the relationship of endocrine secretions to the teeth. The approach to this investigation is based on the practical method of extirpating the hypophysis of the white rat by Van Dyke of the University of Chicago. The most outstanding achievement in the application of this operation is that of Schour and his associates with respect to teeth. They demonstrate conclusively that the pituitary secretion is one of the most important factors if not the only one in the control of the eruption of teeth. The teeth are shown to be delicate indicators of some phases of mineral metabolism. They are now studying the effect of parathyroid secretions and vitamin D—a logical sequel. Schour has shown brilliantly the relationship of fluorine ingestion to mottled enamel. Progress is being made in the study of the rare and obscure forms of paradental disturbance by a similar approach, that is, by careful analysis of endocrine abnormalities in such forms of disease. This last is being done by Becks and his group and perhaps, in a more elaborate way, by the paradentosis group on the continent.

Local anesthesia is still under close scrutiny. Recent research has uncovered two avenues for refinement of its technic; one having to do with the regulation of the hydrogen-ion concentration of solutions and its effect on the speed of induction, duration and control of complications; the other concerned with the replacement of epinephrine. Satisfactory progress has been made in the first instance and research is most active in the second.

There is still lack of outstanding achievement in research on caries despite the quantity of reputable and insistent work that is being performed. A reliable method of producing experimental caries has been demonstrated and verified and minor phenomena of the carious process have been clarified. In spite of this, the major items of etiology and control are still largely as they were and the record shows much frustration and contradictory data. As examples, one may mention the widely quoted work of

1. The figures either quoted or referred to are taken from the Statistics on Dental Education by the Dental Educational Council of America.

the Agnews and Mellanby favoring the vitamin D hypothesis, and that of Day and his associates with others, who came to directly opposite conclusions.

When all the difficulties and handicaps are considered, this progress means a worthwhile addition to our stitch of knowledge and justifies the money, time and effort invested in dental research. This research is contributing to the advancement of knowledge not only in dental territory but also in the whole field of biologic investigation.

In this connection, it should be added that the workers in these fields deserve every aid and appreciation. Nothing is easier to give and more appreciated by them than the publicity that is due their labors. They realize that their procedures, technic and phrasing is a little abstruse and that the average reader is not tempted to follow. Professional journals can serve these men and women in two ways: They can publish abstracts of their scientific publications, abstracts written simply by a sympathetic interpreter, who would delete controversial and relatively insignificant details. They might give of their space to announcements pertinent to research activities, appointments, efforts to spread the information accumulated for the enrichment and edification of the profession.

COUNCIL ON DENTAL THERAPEUTICS

No review of the year would be complete without reference to advances in therapeutics and the part that the A.D.A. Bureau of Chemistry and the Council on Dental Therapeutics have played in the progressive development of that branch of dental science and art.

The most gratifying event of the year to be recorded is the appearance of Accepted Dental Remedies, a small volume, published by the Council on Dental Therapeutics, containing a list of those official drugs (listed in the U. S. Pharmacopeia and National Formulary) which are deemed to be useful in dental practice, and those unofficial drugs which are found acceptable according to the rules of the Council, which have been widely publicized. It was originally hoped to dispose of 1,500 copies, but the demand for the book for the teaching of therapeutics in the schools and from practitioners has been so large that over three times this number of copies have already been sold, and the demand for the book shows no signs of slackening. Consequently, the book is now in its fourth printing. In retrospect, one might have anticipated this wide demand for the book. Scores of appreciations, recommendations, might be quoted if space allowed. The encouragement which they engender and the assurance which they give redound to the Association and the Council alike.

The development of local anesthesia has been one of the phases of dentistry that has brought it from a purely mechanical art to a practical application of the biologic sciences. When, fifty years ago, Koller discovered the local anesthetic properties of cocaine, and, shortly thereafter, William Stuart Holstead of Johns Hopkins University found that he could block the inferior dental nerve, the development of dentistry was speeded and enhanced. The intervening years have brought improvement in the technic of injecting local anesthetic solutions.

Within the last decade, more attention than before has been paid to the composition of the medium in which procaine hydrochloride and epinephrine is carried. Thus, the investigations of Fischer in Germany and of Freeman and his coworkers and others in this country have shown the desirability of using a solution which approaches in alkalinity the

tissue fluids of the body. These investigations were an application to the immediate problem of the investigations of Gros, made in 1910. There are now available suggested methods in the literature for those who desire to simply and conveniently prepare their own solutions having an alkaline reaction. Several preparations having a p_H of over 6 have been listed as acceptable to the Council.

The subject of root canal therapy has, since the origin of the focal infection theory, occupied a prominent place in the practice and deliberation of dentists. At the last meeting of the American Chemical Society, Schmelkes and his co-workers announced the isolation of a new and complex compound, N, N′-Dichloroazodicarbonamidine, given the name Azochloramid. This compound is analogous in chemical reaction to chloramine and dichloramine-T. It differs from these well-known agents and other hypochlorites in being relatively stable in the presence of organic matter and at the same time liberating a sufficient amount of chlorine to yield negative cultures for certain organisms commonly found in the root canal.

Indeed, the year has been a significant one for the advancement of therapeutic art in the dental profession, not only for the material advances made, but also for the development of a skeptical frame of mind on the part of the dental profession.

BUREAU OF PUBLIC RELATIONS

The healthy increase in the demands made on the Bureau of Public Relations by our members and others in 1934 is convincing evidence that the public is acutely interested in dental health and that it desires more and better dental health educational material.

Approximately 4,000 orders were filled and over 125,000 pieces of dental health literature were distributed last year. A total of 7,307 letters were received, furnishing information in some cases, but mostly seeking information on innumerable subjects. The popularity of the visual education department is likewise growing. During the past twelve months, 245 films and 275 sets of slides were rented. In order to care for this demand, many new films and slides were added to the film library. Fifty-two radio talks and thirty-five lectures were given by a Bureau representative during 1934. Five major dental meetings were attended, at four of which an A.D.A. exhibit was shown. Three other exhibits were sent to dental meetings. The figures above quoted prove that this has been the busiest and most productive year of the Bureau's existence. Just as an example, the orders this year tripled the number sent out in past years.

Much new educational material was developed and released during the past year, including a series of fifty-two newspaper articles; fifty-two radio talks; five lectures on the care of children's teeth; six leaflets for first grade school use; one pamphlet for fifth grade school use; one set of fourteen wax models; 150 stereopticon slides, and two A.D.A. exhibits. In addition to these, the Bureau took over the distribution of the booklet describing the dental exhibit at the Century of Progress Exposition.

A new and very important service was added to the Bureau's activities in November. This consists of the issuance of news releases on pertinent subjects to state and component editors. During November and December, four different articles were released to the state and component bulletins. Since February, the constantly increasing activities of the Committee on Economics have demanded more and more of the Bureau's attention. The bulk of the correspondence, the issuance of questionnaires and the compila-

tion of the replies have necessitated additional clerical assistance in the office.

LIBRARY BUREAU

Several hundred dentists each month have obtained reading material from the Library Bureau. Changes in dental interest and technic are reflected in the inquiries received there.

During the past year, many dentists have requested the use of articles on the blood dyscrasias. This is in marked contrast to the lack of interest in this subject five years ago. The relation of diet to dental disease continues to hold an important place, as does the study of endocrinology. More concern is being manifested in the plight of the denture patient and articles on immediate denture service are in great demand.

The books and package libraries on social trends and economic conditions have been borrowed by over 300 people during the past year.

Anyone not using the Library Bureau facilities is missing the best opportunity available to keep abreast of the times.

Comparatively few new books on dental subjects were published during 1934. "Practical Anesthesia for Dental and Oral Surgery" by Seldin has won wide recognition. Blayney's "Dental Pharmacology and Therapeutics" advances materially the dentist's knowledge in this important field. "Osteomyelitis" by Wilensky hits a high mark in subject analysis, history and bookmaking. Likewise "Green's Manual of Pathology" by Vines deserves recommendation. One of the latest books of the year is Thoma's "Clinical Pathology of the Jaws," a thorough text and reference volume. A new edition worth mentioning is the well-known "Mouth Hygiene" by Fones. The Association's own book, "Accepted Dental Remedies," by the Council on Dental Therapeutics, has had a phenomenal reception and evidently fills a long felt need.

One or more books on the subject of prosthetics have been published each year for several years. This year's best known contribution is the "Principles and Technics of Full Denture Construction," by Frahm.

A number of books on socio-economics of interest to dentists have made their appearance during the year. These have been listed in THE JOURNAL.[2]

BUREAU OF STANDARDS

Three times during the year, reports from the Bureau of Standards have appeared in THE JOURNAL: In January, Souder contributed a historical paper entitled "Fifteen Years of Dental Research at the National Bureau of Standards." In April, "A Second Survey of Dental Impression Compounds and of Inlay Casting Waxes," and "Specifications and Certifications for Dental Materials," appeared, and in November came "Zinc Phosphate Cements: Physical Properties and a Specification"—these three by Paffenbarger. These titles bring the work of the Bureau and the Association as close to a dentist's interest as his daily food. As a husbandman trusts to the silent influences of the seasons for his growths and gains, so the daily practice of dentistry trusts to the silent, patient, exacting toil of the men of the Bureau. How exacting their work is may be esteemed by realizing that it must be right. If a man should think lightly of this, all he need do is bind himself by the same standard. Let him place on his office wall the motto, "What I Do Must Be Right," and try for a day to meet the demand. He will find himself "tried as by fire" in his small domain. But these men stand, a focal point between manufacturers, practitioners and the govern-

2. J.A.D.A., 22:187 (Jan.) 1935.

ment. A triple duty demands of them—to the manufacturer justice, to the practitioner service, to the government responsibility. And to that add that science must be kept unsullied. This review seeks only to speak their merit and asks its acknowledgment of all who benefit by their labors.

"A Review of the Year" is a personal production only in the sense of its authorship. In truth, those of whom it speaks are no more than names to the writer. He has never seen many of them. "By their works" only, he knows them. Many willing hands have contributed to its content, all dedicated to the common interest of a better dentistry, a more enthusiastic service in its behalf. It is meant to be devoid of bias or interest in self, intended to show with truth that progress is both reality and possibility, that through a year when loss was common to our thought and speech, gain has been made and gain is being made. And to speak, for the thousands who know and appreciate it, the word due those who have toiled to make what has been told possible.

Bacteriologic Relations between the Appendix and the Oral Cavity

In recent years the department of Professor Gins in the institute for infectious diseases in Berlin has conducted experiments that have clarified the bacterial flora of the teeth, by the cultivation of about twenty former unknown anaerobic organisms without spores. It seemed natural to employ this method also for other tissues. The appendix was chosen because conditions may be expected in its mucous membrane that are favorable for the development and preservation of anaerobic bacteria. The observations thus far have been made on eight surgically removed appendixes, some of which were from acute and some from chronic cases. It was found that the cultivation of non-spore bearing anaerobic bacteria failed in streptobacilli, pneumosintes, Bacterium malaninogenicum, Fusiformis or Vibrio were produced in pure culture. Approximately ten types that were found were identical with forms that were already known to occur in the oral cavity. Nothing definite can be said as yet about their significance in the pathogenesis of appendicitis. At any rate it is worthy of note that, in the microscopic picture of the smears from the mucous membrane of some of the examined cases, certain formerly not cultivable threadlike bacteria predominated. In the critical evaluation of the observations that were made in these experiments, numerous forms of anaerobic Actinomycetes that appeared in the cultures were disregarded, since their occurrence seems to be almost universal, a fact that so far has not been demonstrated with regard to the other types. Nothing is yet known about the time of the first appearance of the non-spore bearing anaerobes in the appendix, but Gins assumed that, in analogy to the oral cavity, they invade the appendix during early youth. In future studies these types should be given especial attention, since some of them, particularly Leptotrichia, may be pathogenic.—*J.A.M.A.*, Dec. 15, 1934.

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Editorials

ONCE MORE

So much has been spoken and written on the subject of pyorrhea that it would seem futile to attempt to add another word. Yet another word must be added if the profession is to keep faith with the people. There has probably been more confusion over this disease than any other that has claimed the attention of the dental profession. One reason for this is the fact that failure of the supporting structures of the teeth, which really constitutes the essence of this affection, is not always caused by the same thing. The moment this fact is borne in on the minds of the profession, and an intelligent search is made for the cause in each case, we shall see greater progress made in controlling the disease.

The most surely fatal edict that has ever been permitted to go out in connection with this subject is to the effect that "Pyorrhea cannot be cured." Of course, it cannot be cured, provided the disease has gone so far that the tissue around the tooth has nearly all

been destroyed and the hapless member is left prone and wobbling, without material support of any kind in a mass of flabby and unregenerate tissue. Miracles are not performed in this latter day, though the manner in which the teeth tighten and become firm and serviceable when the cause is discovered, and the proper remedy applied, surely borders on the miraculous. To make the offhand statement that pyorrhea cannot be cured, and let it go at that, is a travesty on fact and an acknowledgment of gross inefficiency on the part of the one who makes it. As well say that dental caries cannot be cured when we know only too well that teeth with large cavities have been rescued from certain destruction by the removal of decay and the insertion of a suitable filling. We know, because we have tangible evidence, that a decayed tooth will survive the ravages of caries and remain comfortable and efficient under proper treatment for as many as twenty, thirty or even forty years. In fact, there are records of a filled tooth having lasted for half a century, doing excellent service the while and causing no discomfort.

With pyorrhea, while the problem of cure is different and the nature and progress of the disease is less manifest and not so easily observable, the response to proper treatment is, in many cases, just as spectacular, and, in all cases, the obligation is just as great for the serious study of the disease and the most painstaking effort to ameliorate the trouble. Failure on the part of the practitioner to cooperate with the patient to the limit of his ability in any case of pyorrhea is a definite reflection on the intent and ethical standard of the one who so fails. Patients who wish to save their teeth are entitled to receive the benefit of the best skill available, and then if failure does occur, after the most earnest cooperation, the case may be said to be in the hands of the gods. But when patient and practitioner cooperate and the case has not been neglected too long, it is safe to say that the gods are not called on to officiate very frequently.

The fact is that there is no need for the loss of so many teeth from pyorrhea if the proper procedures are taken; and in view of all the consideration that has been given this subject, the marvel is that greater progress has not been made. One reason is the fact just mentioned, that the affection has not always the same cause, and a corol-

lary complication arises in the difficulty of classifying the causes. It is this that has led to the multiplicity of names given the disease from the time the affection was first recognized to the present moment. How many designations have been accorded this disease, we are unable to state at this time, but they are legion. They run the gamut all the way from "Rigg's disease" of venerable lineage to the latest aggregation of letters known as "periodontoclasia"—that conglomerate and confusing corduroy highway of syllables with the bewildering and altogether too numerous number of bumps in it. Mayhap the word is etymologically correct, but as a term of common usage, its chief distinction may be found in its exercise as a tongue twister. A simpler term should be coined even at the expense of adding to an already over-burdened nomenclature. Maybe, in view of its widespread use, the word "pyorrhea" will have to pass muster after all, despite its notorious lack of meaning.

But the thing most needed is a more sincere effort on the part of the profession to combat the trouble, and a more pronounced change of attitude toward the whole situation. It should no longer be considered honest for any dentist to foster the idea that pyorrhea cannot be cured. Under proper conditions, it can be cured, and the needless sacrifice of the natural teeth should be stopped. The undue laudation of full dentures has influenced many patients to neglect their natural organs and resort to artificial substitutes, substitutes which they learn too late do not belie their name—they are nothing but substitutes. It is bootless to raise the question as to which is better, artificial teeth or natural teeth that have been cured of pyorrhea, but the point is that when patients make an appeal to have their natural teeth saved, the dentist should at least cooperate to the extent of putting forth his best effort to see what can be accomplished. Even if the cure of pyorrhea cannot be considered 100 per cent successful, neither can it be contended that the use of artificial dentures is ever 100 per cent satisfactory.

SOME FACTS ABOUT THE RELIEF FUND

It is doubtful that even those who have been most enthusiastic about the success of the Relief Fund, or who have been exceptionally liberal in its support, are able fully to realize all of the ramifications of its working.

The fund was started by a nucleus from the San Francisco Relief Committee that had been organized for relief work among the dentists after the disaster of April, 1906. The minutes of the Executive Council of the 1907 meeting of the National Dental Association at Minneapolis contained the following resolution:

WHEREAS, there is left in the hands of the San Francisco Dental Relief Committee the sum of $3,969.75 after having discharged our duties to the best of our ability in relieving the distress of the dental profession caused by the April disaster, and there being no further urgent need of the money in connection with the relief work; therefore, be it

"Resolved, that the balance of the money now in our hands be turned over to the National Dental Association, to be used as a nucleus for a National Relief Fund, the same to be invested in securities which can be quickly realized upon in case of necessity, the interest of which may be employed for the use of worthy superannuated dentists, and the principal for the relief of dentists who may suffer from any calamity such as flood, earthquake or fire."

The Association accepted the trust thus reposed in it, and began to build up a relief fund that would be worthy of the best traditions of the membership. At various times, small donations were made to the fund, but it was not till the idea of the Christmas Seals was put in operation that the fund grew to its present appreciable proportions. Year after year at the Christmas season, seals are sent to the members and the proceeds are used to augment the fund.

It was early realized that the sole equitable and safe way of dispensing relief was to use only the interest, and not dip into the fund itself. If the principal were ever used to furnish aid to the members, the whole relief structure would rapidly collapse and the fund be dissipated. By conserving the fund and adding to it each year, greater and still greater facilities are provided for dispensing relief, because, manifestly the larger the fund grows, the greater is the amount of relief that is made available in interest.

The present Relief Fund aggregates in investments something more than $332,452.84, and, as stated by Drs. Casto and Pinney at

the time the Seals were sent out this year, there has been distributed to our needy members in excess of $100,000.00 in relief. During the year 1933-1934, the earnings from relief fund investments amounted to $15,647.23. It is only by the wisest management that the present fund has been built, and once more we wish to commend the various members of the Relief Committees and Commissions, as well as the Treasurer and Business Manager for the wise manner in which this enterprise has been administered. They are entitled to the thanks of the entire membership.

Various means have been suggested for increasing the fund more rapidly, as the needs are constantly becoming ever more apparent. It may easily be surmised that, during the recent difficult economic situation, the facilities of our relief organization have sometimes been taxed to their utmost to meet the demands. And there is another possible contingency that must never be forgotten, though, fortunately, since the San Francisco disaster in 1906, there has been no outstanding widespread or appalling calamity to tax the available resources of our relief machinery. But no one can predict when such calamity may come and we should build our Relief Fund to a point where it will be well-nigh impregnable. One force that has lent strength to the relief idea has been the encouragement accorded it on the part of the state bulletins. The editors of the component publications have, in season and out of season, emphasized the great benefit of this movement, and, through the medium of these agencies, great good has been accomplished.

Under date of Dec. 12, 1934, Vern D. Irwin, editor of *North-West Dentistry,* sends the following suggestion:

> I have just written to President Casto suggesting a novel means of raising money for the A.D.A. Relief Fund.
>
> If the A.D.A. membership would save its amalgam scrap, which now sells for 12 cents an ounce, considerable money could be raised for this fund. The plan could be handled through the local district dental societies.
>
> Whether or not the A.D.A. adopts this idea, I am going to put it up before the House of Delegates at our state association meeting in February.
>
> With my very best wishes and pre-holiday greetings, I am
>
> Very sincerely yours,
>
> (Signed) VERN D. IRWIN.

Just as we go to press, word has come from Dr. Harry A. Paskow, Elizabeth, N. J., that he has saved 25 pounds of amalgam scrap in

the course of his practice, the proceeds of which he now purposes donating to the Relief Fund. Let the good work go on.

Fred R. Adams, secretary of the Dental Relief Fund Committee, makes the statement in a recent communication that he cannot understand why there should be any hesitation in accepting funds from supply houses, laboratories or manufacturers. He says that last year about $600 was collected from these sources and he hopes to get $1,000 this year. He thinks that the list should be published in THE JOURNAL.

A very worthy ambition is being developed on the part of some of our societies in connection with the sale of the seals. A growing number of societies are recording 100 per cent response from their members, and this is most encouraging. We should be glad to publish the names of such societies if they were all handed in to us, but we hesitate to publish a few that we chance to know, and possibly omit others who have done as commendable work.

There are a number of other features of the activities of our relief organization that we wish to discuss at another time. We feel that the entire membership should be made as thoroughly familiar as possible with this most praiseworthy enterprise.

WHAT THEY DO IS NEWS

The title "What They Do Is News" is borrowed. The newsmakers to which "they" refers were far removed from those to whom it applies here; but we shall use it without apology.

The daily press recently announced the names of three Nobel Prize winners, three physicians, discoverers of liver therapy for anemia. Two of them worked together; one worked alone. One was himself anemic. A few years ago, despair hung over him like a cloud. He felt his strength lessening, reckoned his days as few, "the dark" was not far ahead. A physician, he had seen others droop and succumb. That alone was incentive enough for him to seek a cure. Imagine the fever of his pursuit when he himself was clutched by the disease. "Anemia is incurable," said the science of the world. "There is a cure," said he, "and I must find it." He made himself

subject of his own experiments. He reasoned out his program from premises of physiology and embryology. He ate liver until he was revolted by it.

No newspaper spread 4-inch letters across its front page to announce the discovery of this man and his colaborers. No holiday was declared. But one may imagine, if he can, the news value of the item to the sufferers of anemia throughout the world. To them it was news. Sublimated news. Reprieve from certain death!

There is research and research, as all readers know. There is the research that to the observer has only an academic interest, gives a thrill only to those who would know for the sake of knowing. The latter stress the value of all knowledge from any sphere that may, some future day, give solution to some vital issue. They build a foundation for culture in an appreciation of truth. Others search out physical phenomena to harness the energies of the universe to the purposes of man. In their application, they raise every moment of life to unknown powers. "Better fifty years of Europe than a cycle in Cathay." What they accomplish matures by such slow steps that the end of their labors is often after they are gone. Still, what they do is news. They get no advertisement, they get no glory, they build by slow degrees as corals climb from the bottom of the sea.

There are few triumphs of science that are spectacular in a reportorial sense. Many of them form only bases for further research. Pasteur's bacteria gave a sound beginning to a new pathology, a new therapeutics. That was half the battle in some instances; in others, it changed the method of warfare, but left the war yet to be fought. The discovery of insulin might well have had a headline, for diabetes had become a common word. But bacteria in Pasteur's day were pure fantasy to the public mind and difficult to popular speech. Jenner deserved a full page, but got scorn and ridicule. In those "humoral days," who would have read a line about virus, vaccination? But neither public nor press is to be blamed. Scientists are slow to thrill to an abrupt pronouncement, and workers are too absorbed with their quests to think of accolades. They seek honor only from the gods of revelation and such gods are besought only by work. Fifty years after Pasteur's discovery, physicians were to be found who pooh-poohed at his findings, did not believe bacteria

caused disease. But, looking back, with the understanding modern medicine affords, we know that what he did was news!

There have been and are heroics in research. "Men against death" are always heroic. One thinks of the courage of early navigators, of explorers, armed handfuls, assaulting populous strongholds, and waging war on the invisible armies of death in the same moment. Bruce in Africa, Carrol in Cuba, Rickets in Central America! Such men deserve any paean that can be sung, any praise that tongue or pen may give. Bubonic plague gone, yellow fever gone, smallpox gone, typhoid fever gone! And what news was their going! To these who dared in such spectacular displays, who made the final sacrifice, we add those who, with weary hands, burning eyes and tired brains carry on unfalteringly in defense of their fellows, who, while time wears on, wear themselves away to make life safe from disease. Both men and women have made and at the moment make the quiet but sacred dedication.

The essence of this devotion is one with that of the canon of human sainthood. The insistency of this passion for truth, for a diseaseless, undeformed life, maintains its own flame. And when that flame burns, nothing can quench it. Today, in places where no day gives assurance of another, where governmental instability threatens and economic uncertainty dares, men stand by their tasks as Becket stood by his altar. One reads the titles, the processes, the results of research that comes from Germany today in every phase of medical science with amazement. One recalls research carried out on this empty prairie by a lone man and concludes that things, money, are not requisite to success—only devotion.

Researches do not submit to comparison at all readily. And we would not compare them. The human element never fails to give them irresistible fascination. Animal research has an absorbing interest. We watch the workers bending over a rat or rabbit or dog, observing, deducing, recording with multiple intensity. Time is not reckoned, patience is not measured, comfort is not considered. Finally, conclusions are reached. "But," it is said, "that was only a dog." True. But on it methods were learned, observations made, minds schooled to emergency, to possibility. Here is preparation for the greatest of all responsibilities. Dogs have sacrificed them-

selves in loyalty to their masters; men have sacrificed themselves to the needs of men. Science has no compunction in the offerings it makes to stop the ravages of disease. Dogs die for dogs in the laboratory; also, they die for mankind. A scientist tries out his experiment on plants first, then frogs, then rats, then dogs, then apes. Assured at last, he mounts the table himself and submits to his own therapy. There is something of exaltation in the act—an exaltation that is shared by the lower lives that went before. But it is that last step that tries him. From anthropoid to man. It is there he must win. It is here success must be and here alone. What news! "Experimenter submits to his own experiment!" And it works!

And finally their findings, with the supporting sacrifices and risk and suffering, are given to the world "without money and without price." What they do is news!

T.

SEIBERT D. BOAK, D.D.S.
1876-1934

Seibert D. Boak, colonel in the United States Army, died Nov. 22, 1934, in San Francisco. Funeral services were held with full military honors. At the time of his death, Colonel Boak was the ranking officer in the Dental Corps.

His parents, Jacob Seibert and Katie Amelia (Davis) Boak, lived in Frederick County, Virginia, at the time of his birth, June 30, 1876. He attended high school and Franklin and Marshall College, and was admitted to National University, Washington, D. C., in 1897, completing the requirements for the dental degree in 1900 and for the M.D. degree in 1907.

Shortly after graduation, he was appointed contract dental surgeon in the United States Army, April 15, 1901. He was commissioned first lieutenant, April 15, 1911; captain, June 3, 1916, and colonel, Oct. 6, 1917. He rendered a highly commendable service for more than thirty-three years. During this period of service, he was on duty in the Philippines, 1901-1904, and in Cuba, 1906-1909.

During the World War, he served as chief dental surgeon with the Third United States Army and the Army of Occupation and director of the dental section of the Army Sanitary School. He was the first commandant at the Army Dental School, Army Center, Washington, D. C., which was organized in 1921. For meritorious service in the World War, he was awarded the Distinguished Service Medal.

During his lifetime, he contributed many papers and presented a great many clinics before both medical and dental professional groups. While stationed at the Presidio of San Francisco, 1928-1932, he presented a series of lectures and clinics to the faculty of the University of California College of Dentistry at the Letterman Hospital.

In June, 1933, Colonel Boak returned to his former post at the Letterman General

Hospital and proceeded to reestablish the outstanding dental surgical clinic which he had built up on previous assignments.

Distinguished as a teacher, organizer and oral surgeon, faithful in his duty to his country, kind to those under his care, loved by his family and his friends, Seibert D. Boak enriched the lives of the men he knew and served.

GUY S. MILLBERRY.

PRACTICE IN PARAGRAPHS

This department is intended for busy readers. It aims to tell a vivid story in a few words. Items should be of a practical character, and free from padding—not more than a paragraph or two. We exact no limit, but two hundred words can tell most of these stories. Send in your ideas; they will be welcome.

A Serviceable Wax—A serviceable sticky wax can be made by mixing equal parts of baseplate and ordinary resin.—*L. E. Kurth, Chicago.*

Monetary Saving—By diligent search of Accepted Dental Remedies, the formulas of many well-known proprietary drugs can be obtained. A large monetary saving can then be effected if the dentist will compound them for his own use.

Bleaching Agents—Few dentists have on hand sodium dioxide, barium dioxide or a patent preparation for use as a bleaching agent. I have found a combination of common drugs, if used in saturated solution, will give excellent results: sodium perborate in hydrogen peroxide, U.S.P.—*David W. Weill, Park Ridge, N. J.*

Friendship Vs. Debt:—A lost account generally means a lost friend. Patients who pay best like their dentist. Considering a new patient as just another oral cavity is unlikely to make friends or assure best results. Overfamiliarity often breeds contempt, while underfriendship is an unfortunate dental relationship. "Long accounts make short friends" and bad liabilities for the next dentist.—*Herbert Ely Williams, Red Bank, N. J.*

Perspective—Masterpieces in oil look crude on "close up." As we back away, their beauty becomes apparent. "Skintled" brick house chimneys have no appeal until seen from across the road. Clever architects say that everything should look attractive without our knowing why. Dentures with teeth set almost at random, seemingly excessively irregular, will blend nicely with the many imperfections and irregularities of the average human face. A thing should be made to look best from the distance from which it is most likely to be seen. Fortunately, few people are seen at an extremely short range.—*Herbert Ely Williams, Red Bank, N. J.*

We Move On—In replacing appliances or equipment ordinarily German plated, I am glad of the opportunity to secure chromium plate. These appliances are much easier kept looking "fit" and clean and appear to wear better. My choice is also for the stainless steel instrument where obtainable. The young dental graduate is in luck in that in putting in his equipment, he has such a wealth of good things to select from. He should inform himself so as to choose wisely and well.—*Ryland O. Sadler, Baltimore, Md.*

To Control Solder for Adding to Inlays and Crowns for Contact—A 2-square-inch piece of asbestos paper is dampened, and, with a sharp instrument, a 2-mm. hole is punched in the center and this opening placed over the desired contact point, the balance of asbestos paper being worked around the inlay as if it were investment and to hold the contact point up. The hole is shaped with a sharp-pointed instrument by pushing the wet paper to one side. It is dried with a brush flame before soldering.—*F. J. Svoboda, Cozad, Nebr.*

Gold Foil Vs. Inlays—Edison contended that woman's mind was more given to details than man's mind. A woman dentist on that basis should excel in gold foil operations. The gold foil filling is strictly a detail enterprise, and that is why so many men evade it entirely. Condensing fifty or sixty foil cylinders in a lower molar occlusal cavity fails to appeal to the majority of dentists because, as Edison said, "the male mind is lacking in details." Most dentists prefer something that will go in a tooth all in one lump.—*Herbert Ely Williams, Red Bank, N. J.*

"Hurry Up" Investment—Asbestos mulch made from asbestos paper that is wet until it is a bit soggy makes an ideal "hurry up" investment. Though not of great accuracy, it is of great convenience in some orthodontic soldering, repairing of crowns and bridges, tails to clasps, etc. It is used the same as investment; i.e., only those parts to be soldered are left exposed, the operator working directly to the iron grill so the work will not have to be moved from the bench when once in position. It is placed over a slow fire or dried out with a brush flame from a torch, a matter of two or three minutes. The operator then proceeds to solder.—*F. J. Svoboda, Cozad, Nebr.*

Soap and Cold Cream—The dentist does, or should, wash his hands many times during his working day. One should by all means select a good soap; dry the hands well, and each night, especially during the winter months, anoint them with a good cold cream. This helps to restore the natural oil that frequent bathing takes out of the hands. I have for some years also anointed the lower lip of patients with a good cold cream before operating. It is now requested by old patients, should I seem to forget it. In only two or three cases has any objection been offered to this safeguard. One lady said that she was fearful lest it would start the growth of hair on her face. I assured her that my fortune would be made if I could thus put hair on bald pates or the upper lip of ambitious young men.—*Ryland O. Sadler, Baltimore, Md.*

COUNCIL ON DENTAL THERAPEUTICS

TARTAROFF—NOT ADMISSIBLE TO ACCEPTED DENTAL REMEDIES

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

Tartaroff was examined in the A.D.A. Bureau of Chemistry in 1928, and found to be essentially a solution of hydrochloric acid in water.[1]

The article was concluded as follows:

If such a dangerous fluid as hydrochloric acid is indicated, it must be used with extreme care on the teeth and then only in the hands of a skilled dental operator. It should never be used by the laity. The profession would do well to inform the laity of the dangerous character of this preparation, and the injurious result of its use.

A further note on the injurious properties appeared in 1930.[2]

Since that report, other inquiries concerning Tartaroff have come to the Council. It was therefore deemed advisable to reexamine the product currently being sold as Tartaroff. The chemist's report follows:

Twelve original packages of Tartaroff (Tartaroff Company, Chicago, Ill.), price 24 cents each, were purchased on the open market for examination.

The following appeared on the carton:

Tartaroff is harmless and efficient.

The following appeared on the circular which accompanied the package:

TARTAROFF, a sensational new liquid discovery, removes all blemishes and turns cloudy teeth to sparkling WHITE within a minute. Just a SAFE, harmless, magic liquid that accomplishes things no tooth paste ever can! This wonderful formula is a simple raspberry-colored liquid, contains natural ingredients—secretly combined which gives astonishing results. Absolutely SAFE and harmless.

Each bottle contained approximately 9 c.c. of a red liquid, possessing an odor of cinnamon and an acid taste. The liquid was acid to litmus, and turned yellow in the addition of ammonium hydroxide. The specific gravity at 25 C. was 1.018. Chlorides, sulphates and tartrates were not found. Cations were not found. Qualitative tests indicated the presence of citric acid.

Quantitative determinations yielded the following:

Residue (100 C.)	4.46 gm. per 100 c.c.
Ash	0.006 gm. per 100 c.c.
Acid, as citric acid U.S.P.	4.42 gm. per 100 c.c.

Iron was found in the ash.

From the foregoing, it may be concluded that a solution having the essential properties of Tartaroff may be made by dissolving citric acid, U.S.P., 4.5 gm., in water to make 100 c.c.

1. J.A.D.A., 15:2167 (Nov.) 1928.
2. J.A.D.A., 17:344 (Feb.) 1930.

TOOTH IMMERSION TESTS

In order to observe the effects of Tartaroff on teeth, extracted teeth were treated with Tartaroff for varying periods of time, and the amounts of dissolved calcium and phosphorus determined.

No.	Time of Immersion	Calcium Found, Mg.	Phosphorus Found, Mg.
1	5 min.	1.05	0.25
2	10 min.	1.44	0.24
3	30 min.	1.75	0.63
4	60 min.	1.86	1.44
5	6 hr.	7.16	3.89
6	24 hr.	11.61	5.69
7	48 hr.	11.91	8.51

Each tooth was covered with 2 c.c. of Tartaroff. At the end of the predetermined time, the liquid was transferred with water to a beaker, the resulting volume measuring about 15 c.c.

Calcium was determined by precipitation with ammonium oxalate in alkaline solution, and subsequent titration with 0.02 normal potassium permanganate.

Phosphorus was determined by precipitation in nitric acid solution with ammonium molybdate. The phosphomolybdate precipitate was filtered, washed with dilute ammonium nitrate solution, dissolved in an excess of approximately 0.1 normal sodium hydroxide, and the excess alkali titrated with acid.

From the foregoing, it may be concluded that Tartaroff in contact with tooth substance dissolves calcium and phosphorus, the amount dissolved being a function of the time.

Statements that Tartaroff is absolutely safe are contrary to these facts.

(End of chemist's report)

In view of the foregoing report of the A.D.A. Bureau of Chemistry, which shows Tartaroff to be essentially a solution of citric acid in water, and demonstrates its effect in dissolving the enamel of the teeth, Tartaroff is declared inadmissible to A.D.R.

The Council desires to point out that the use of such products for whitening the teeth is contrary to the public interest, and that dentists should advise their patients concerning the potential harmfulness of Tartaroff when applied to the teeth.

KELPODINE—NOT ADMISSIBLE TO ACCEPTED DENTAL REMEDIES

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

Recently, a number of inquiries concerning Kelpodine (Lee Kelpodine Co., Inc., New York) were received. In a piece of advertising "The Endocrines and Mineral Deficiency," the following appears: "Mineral deficiency in the daily diet is now known to be the most outstanding cause of endocrine gland dysfunction. Kelpodine, a pure concentrate, in tablet form, of the giant kelp plant from the Pacific Ocean, brings to the physician a potent means of fortifying the diet with all the essential mineral elements necessary to normal endocrine functions." Many generalities concerning the relationship of iodine to the thyroid gland and to its part in bodily processes appear with frequent references, by name, to recognized investigators in these fields, but not to the literature.

It is further stated that:

Kelpodine supplies not only ample iodine requirements but is rich in all other essential min-

erals that are so frequently lacking in the daily bill of fare. Kelpodine is recommended to the physician in the following conditions as a dietary adjunct to regular measures: anemia, goitre, rickets, obesity, asthma, diabetes, adynamia, acidosis, dyspepsia, neuritis, lumbago, gout, sinusitus, lack of virility, early baldness, chronic constipation, arthritis, certain skin diseases, neurasthenia, high blood pressure, pyorrhea, menopause disorders, menstrual disturbances, mental and physical backwardness in children, premature senility, heart conditions of many kinds, tuberculosis, neurosis, rheumatism, sciatica, anorexia, underweight, frigidity, sterility, alopecia, psoriasis, eczema, low vitality, fatigue, neuralgia, enuresis, dyspnea, hay fever, mental torpor, bleeding gums, asthenia, sluggish liver, myasthenia, infectious tonsilitis, nerve instability, gastric ulcers, toxic conditions, dental caries, tic douloureux, digestive disturbances, susceptibility to colds, and other infectious diseases.

No evidence in support of the usefulness of kelp or Kelpodine in the conditions listed above has been made available by the manufacturer, either in the advertising or at the invitation of the Council. A survey of the Quarterly Cumulative Index indicates that little has appeared in the literature on the use of kelp in medicine, although kelp as a source of iodine has been known to chemists for a long time.

Kelpodine is apparently a dried preparation of kelp in tablet form. It may be accepted that the preparation should be rich in iodine, and it is stated to contain 0.25 per cent of iodine, but no data are given regarding the various other minerals which are said to be present, and which are used to bolster up the claims.

There are four elements which, under certain conditions *may* be present in our food in inadequate amounts. These are calcium, phosphorus, iron and iodine. The calcium and phosphorus deficiencies can most readily be made up, as H. C. Sherman and others have pointed out, by increasing the intake of milk. Although certain foods, notably milk, are poor in iron, there does not appear to be an iron deficiency in a well-balanced diet. Certain forms of anemia (hypochromic) respond readily to large doses of inorganic iron. It is well known that the regions in which endemic goiter is present are remote from the seaboard, and are associated with a low content of iodine in the water supply. In recent years, this iodine deficiency has been readily made up by the addition of inorganic iodides to the water supply or to household salt.

Admitting its possible value as a source of iodine, there is no evidence presented that Kelpodine is superior to these simple and less expensive sources of iodine. Regardless of the molecular condition of iodine in kelp, the iodine will have to be converted into sodium iodide before absorption.

In view of the paucity of information on the calcium, phosphorus and iron content of Kelpodine, it is difficult to see how Kelpodine can be of any great value as a source of calcium or phosphorus or of any importance as a source of iron.

In view of the foregoing, there is no justification for calling Kelpodine "a food supplement, not a drug," since its only possible value would appear to be as a source of iodine, possibly inferior to that of the inorganic iodides. Furthermore, on the basis of the lack of evidence, it is difficult to perceive how Kelpodine can be advertised as a "guaranteed method of treating pyorrhea alveolaris" or why it is indicated in dental caries, sinusitis, infectious tonsilitis, tic douloureux, diabetes, tuberculosis, dyspnea, underweight, obesity, alopecia, lack of virility, frigidity, sterility, etc., etc., unless it is a "cure-all."

In view of the foregoing, Kelpodine is declared inadmissible to A.D.R.

VALIDOL AND VALIDOL CAMPHORATUM—NOT ACCEPTABLE FOR A.D.R.

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

Validol and Validol Camphoratum were submitted to the Council by Merck & Co., Inc., New York, as American agents for Vereinigte Chininfabriken, Zimmer & Co., Frankfort-on-the-Main, Germany.

Validol is stated to be Menthyl Valerianate, $C_{10}H_{19}O.C_5H_9O$, the menthyl ester of valerianic acid containing about 30 per cent of free menthol. It is a viscous, colorless liquid with a mild and pleasant odor and refreshing, cool and faintly bitter taste. Validol Camphoratum is stated to be a 10 per cent solution of camphor in Validol, with physical properties similar to those of Validol. Both products are intended for internal use, and Validol Camphoratum is intended for local use also. They represent modified forms of the old valerian medicament.

Valerian therapy is a hangover from the therapeutics of the middle ages when it was largely employed as a sedative, but, in recent times, the indications for its use have been met by drugs of more certain action and less disagreeable taste. It has been generally believed that any benefit that may accrue from the administration of preparations that contain, or are derivatives of, valerianic acid can be attributed only to the mental impressions caused by their unpleasant odor and taste, and not to any systemic action after absorption. The disuse into which valerian therapy has fallen is illustrated by a survey of the indices of the *Journal of the American Medical Association* for the years 1908 to 1924. No references to any articles dealing with the therapeutic value of valerian or its substitutes appear during this period. The work of Pilcher, Burman and Delzell[1] does not support the therapeutic claims commonly made for valerian and its substitutes. The recent work of Haffner[2] indicates that injections of very large doses of an infusion of baldrian, a drug containing esters of valerianic acid, cause depression in mice, preceded by considerable excitation. The use to which such a sedative might be put is not indicated, but the drug obviously would be inferior to a host of other well known hypnotics. The favorable impressions of Manson[3] concerning the actions and usefulness of valerian in the treatment of minor neuroses are unsupported by critical evidence and are not convincing because the conditions are amenable to suggestion.

Validol is stated to be useful in hysteria, migraine, gastralgia, gastritis, vomiting of pregnancy, exhaustion, hypochondria, syncope and certain reflex neuroses; a group of ill-defined conditions. Most of these conditions are not necessarily referable or related to dental disorders and do not come within the scope of dental therapeutics.

Validol Camphoratum is stated to be useful in odontalgia, either as applied to the pulp or when inserted on cotton into the previously incised cavity. No evidence of its advantages over simple camphor preparations has been submitted. Any counterirritation, slight local depression or subjective reactions from a local cooling sensation can be just as well, or better, obtained from camphor or menthol, or preparations containing either or both of these stearoptens.

Unless further convincing evidence is forthcoming, the Council cannot accept the claims of usefulness for Validol and Validol Camphoratum.

1. Arch. Int. Med., 18:557, 1916.
2. Haffner, F.: Munchen. med. Wchnschr., 76:271 (Feb.) 1929.
3. Manson, J. S.: Brit. Med. J., 2:842 (Nov. 10) 1928.

Validol and Validol Camphoratum are not acceptable for Accepted Dental Remedies because they represent drugs which are essentially useless and which have been replaced in modern therapeutics by drugs of more constant and certain action.

CAPSONITE—NOT ACCEPTABLE FOR A.D.R.

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

Capsonite is stated to be prepared by the Steel Laboratories, of Cleveland, Ohio. According to information sent to the Council, Capsonite has the following composition:

Tincture aconite—1 part.
Tincture iodine—1 part.
Chloroform—2 parts
Capsicum min. V to the ounce.
Ephedrine in oil 1% solution 2 ounces to the gallon, giving only a trace.

No statement of composition other than "Alcohol 38%" appears on the label, although chloroform is a constituent of the mixture. The Federal Food and Drugs Act of 1906 lists chloroform as one of the eleven drugs the presence of which must be stated on the label. The preparation is thus in conflict with Rule 1, requiring that a statement of composition must appear on the principal label.

Capsonite is stated to be the "Counter-Irritant Supreme" and is recommended, according to advertising in the dental journals:

As an antiseptic, germicide, counterirritant, and topical anesthetic. Indicated in pulpitis, pyorrhea alveolaris, post extraction pain, denture sores, as topical anesthetic and in cases of Vincent's infection.

Capsonite is claimed to be:

. . . incomparable in the treatment of Vincent's Disease for the following reasons:
1. Capsonite fixes bacteria and prevents their further ingress into the tissues.
2. Capsonite destroys bacteria and promotes healing.
3. Capsonite through its counter-irritant properties stimulates the circulation and dissipates congestion.
4. Capsonite will not blister the delicate mucous membranes of the oral cavity when applied.

No evidence of the general application of this well-known remedy as claimed in the advertisements has come to the Council, although the promoters of the product have corresponded with the Council.

From the foregoing statement of composition, it is readily apparent that Capsonite is the well-known tincture of aconite, tincture of iodine and chloroform mixture, unessentially and irrationally modified by the addition of small amounts of ephedrine and capsicum. The rationality for including the small amount of ephedrine or the addition of another counterirritant in minute amounts to an already complex mixture of three potential counterirritants is not apparent. Such a mixture of aconite, iodine and chloroform has found limited use in dentistry as one of the many remedies for acute apical pericemental disturbances of nonseptic origin. Its action as such may be considered to be restricted solely to any counterirritant effect that it may have in overcoming such pain by diversion of attention from the seat of the pain. The recipe is given in standard textbooks on dental materia medica, and the mixture is endowed with no virtues beyond its local irritating action.

Evidence for the rationality of including capsicum and ephedrine has not been made available. Aconite was formerly used to a slight extent in therapeutics to slow the pulse and reduce the temperature, but because of the inherent dangers of the alkaloid,

aconitine, its use today is almost limited to its incorporation in liniments, to which class the dental preparation belongs. The combination of local irritant effects with some anesthetic action on the peripheral nerves suggested its use in local neuralgia, and possibly its use for this purpose in dentistry. It must not be forgotten that if used too freely for this purpose, even on unbroken skin, it may be absorbed through the unbroken skin in sufficient quantities to cause serious poisoning. Because of its well-known irritating properties, combined with similar properties of tincture of iodine and chloroform on open wounds or broken mucous membrane, it is readily apparent why it would not be generally used on such surfaces. Thus, clinical dentistry has wisely circumscribed its use.

The rationality of diluting the tincture of aconite with tincture of iodine is not clear, for the tincture of iodine merely dilutes the tincture of aconite. (The U.S. Pharmacopeia tincture of aconite, now official, is 10 per cent instead of 35 per cent, as in previous editions of the Pharmacopeia.) It is well known that tincture of iodine, in addition to its germicidal properties, acts as a local counterirritant, but its use for these purposes has been obtained by drugs with more prompt response, and the use of tincture of iodine is, at the present time, almost wholly limited to its germicidal properties. Hence, it may well be questioned whether the tincture of iodine is necessary in such a recipe. In any event, Capsonite represents this old recipe, further irrationally modified, and the claims have been extended from its extremely limited usefulness to an almost general application in dentistry without furnishing adequate evidence to support the claims. Such use of a recipe of limited usefulness in dentistry extended to include almost the whole range of dental practice, without making available adequate evidence, cannot be considered in the interest of scientific dentistry or of the public. The Council therefore must declare Capsonite unacceptable for A.D.R.: because a statement of composition does not appear on the label (Rule 1); tests for controlling the activity of the aconite contained therein have not been made available (Rule 2); it is advertised to the profession with unwarranted therapeutic claims (Rule 6); the name is objectionable because it represents a proprietary name for a well-known recipe, and its name does not indicate the most potent ingredient, capsicum being present to an insignificant amount (Rule 8), and because it represents an unscientific and useless article which cannot be accepted because its general use is inimical to the best interests of the dental profession and of the public (Rule 10).

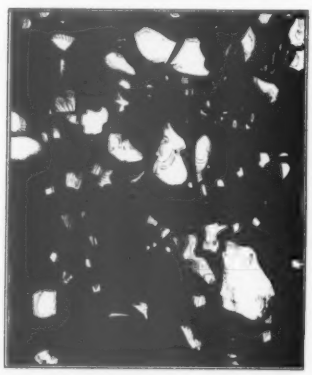
The Council desires to point out that if dentists desire to control local pain, there are available preparations such as mustard, capsicum, ginger, etc., for counterirritation, and analgesic drugs of known composition, such as acetphenetidin, acetylsalicylic acid, amidopyrine and codeine, for internal administration.

Clinical Evidence: To be acceptable, the clinical evidence must offer objective data with such citation of sources as will enable the Council to confirm the facts and establish the scientific value of the conclusions drawn. The amount and character of the evidence which is required depends on the inherent probability of the claims. No evidence is needed for a self evident claim; very strong evidence is needed when the claim is contrary to the accepted data of science. The acceptability of evidence is determined mainly by its quality. The mere multiplication of inaccurate observations does not render them accurate. The evidence must be furnished in sufficient detail to permit judgment as to the care with which it was gathered and the legitimacy of the deductions. Comparative trials facilitate and are often necessary for such judgment. Observations that are not described with sufficient detail to permit verification are subject to suspicion. The credibility of the data and the justification of the deductions is influenced by the reputation and experience of the investigators, as to disinterestedness, technical ability, and critical sense. Anonymous communications and observations gathered without adequate facilities are usually worthless as evidence.—Accepted Dental Remedies.

LAVITA

THE CLAIMS

THE FINDINGS:



PUMICE 84%

One of the many reasons why the profession needs the protection of the BUREAU of CHEMISTRY and the COUNCIL.

This and the chart on the following page are a part of an exhibit of the Council on Dental Therapeutics presented at the St. Paul Session, Aug. 6-10, 1934.

EMEDENT PYORRHEA TREATMENT

DR. C. S. WILLIAMS

20 c.c. of Emedent Pyorrhea Solution sold for ten dollars.

ANALYSIS REVEALED THAT IT WAS A **41% SOLUTION OF SULPHURIC ACID.**

Would you knowingly pay ten dollars for less than one cent's worth of H_2SO_4 ?

BUREAU OF PUBLIC RELATIONS

RESTORATIVE DENTISTRY FOR THE CHILD*

By FLOYDE EDDY HOGEBOOM, D.D.S., Los Angeles, Calif.

I SHALL review certain operations used in correcting carious and unhealthy conditions in the child's mouth, discussing: 1. Cavity preparations in deciduous teeth. 2. Interproximal caries in bicuspids and molars. 3. Hypoplastic molars. 4. Broken and fractured incisors.

CAVITY PREPARATIONS IN DECIDUOUS TEETH

The classification of cavities in deciduous teeth, according to Black, is the same as that in permanent teeth, with slight modifications.

Class I cavities, which present no particular difficulties, can be filled with copper amalgam, silver amalgam or a cement, as the operator prefers.

Class II cavities are by far the most frequently seen type in deciduous teeth. A nidus of decay starts between the first and second deciduous molars, probably because of the slight opening of the contact point which is frequently present. Therefore, where one cavity is present, in most cases two will be present. Small bitewing roentgen-ray films will reveal this condition where an explorer cannot penetrate.

I wish to call attention to the order of procedure in filling these cavities. The distal tooth should be filled first. The filling can be polished at the next sitting and the cavity prepared and filled in the first deciduous molar. Figure 1 illustrates the reason for this. As the first deciduous molar is exfoliated first, the first bicuspid, as it erupts, will have the smooth surface of the second deciduous molar to erupt against.

Several essential points must be observed in preparing a Class II cavity. The occlusal surface margins must be brought well up on the cusp slopes in the outline form. The mesial and distal aspects must be extended well out into the embrasure. A review of the anatomy of the deciduous molars will show the necessity for a slight modification in cavity preparation as compared with that in a permanent tooth. The pulp is so large in proportion to the crown that the gingival seat does not allow of more than a millimeter space without endangering the pulp.

The gingival seat is secured by taking a medium-sized inverted cone bur and cutting straight across. At one angle, it is necessary to reverse the bur to keep it from traveling around the tooth. Either a fissure bur or an inverted cone bur is employed to cut across the occlusal portion for a step, with the outline form in mind. Small enamel hatchets are used to square up the gingival portion that was not accessible to the bur, the proximal walls being paralleled with the same

*Read before the Section on Mouth Hygiene and Preventive Dentistry at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 9, 1934.

enamel hatchets. A slight undercut will often assist in holding the filling material. The junction of the occlusal and proximal portions of the cavities is the weakest point. The step must be widened gradually out into the proximal portion, with avoidance of a sharp junction. A break will occur when stress is brought to bear near the marginal ridge, if there is a sudden flare instead of a gradual divergence.

Great care must be exercised in removing caries in Class II cavities. As the pulps are usually exposed near the gingivoproximal angle, a large spoon is used at this point, to avoid making a sudden puncture into a nearly exposed pulp. If necessary, the carious dentin is removed, with the extirpation of the pulp.

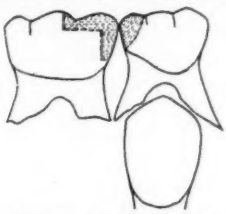


Fig. 1.—Interproximal caries in first and second deciduous molars; distal tooth restored first.

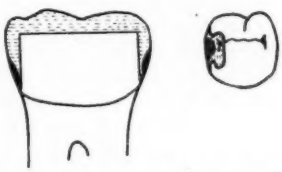


Fig. 2.—Interproximal caries, inlay preparation.

Class III and IV cavities present the difficulty of small teeth and necessarily limited preparations. I have enlarged on Class II preparations because of their importance.

One thing must be emphasized. When the second deciduous molar is lost, the child should be examined immediately for incipient caries under the mesial contact point on the first permanent molar, and appropriate methods used for the condition found.

INTERPROXIMAL CARIES IN BICUSPIDS AND MOLARS

Bitewing films should be used regularly on children, and particularly when the bicuspids are in place. Many times, in adolescent and young adults, these roentgenograms will reveal incipient interproximal caries. Correction of the habits of hygiene, and advice on diet will help, but after the damage is done, these cavities must be filled. A thin slice inlay preparation is the best restoration. Figure 2 shows this type of cavity preparation, which affords a minimum of tooth destruction with a maximum of strength. I do not care for amalgam in this type of restoration.

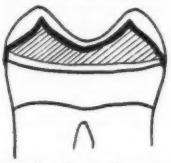


Fig. 3.—Hypoplastic molar with cast restoration.

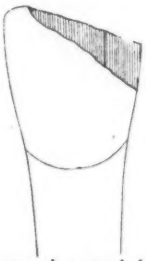


Fig. 4.—Fractured central incisor, lingual view.

HYPOPLASTIC MOLARS

One of the most difficult problems in operative dentistry is the care of hypo-

plastic first permanent molars. Owing to some interruption during fetal development, the enamel-forming cells are injured, and the occlusal surface of these molars is imperfectly formed. It may be a mass of small pits and fissures imperfectly coalesced. Unless properly cared for, these pits are very liable to become carious at an early age. When this condition is discovered, the parent should be told about it, as to why it happened, what is liable to happen and how the attending dentist wishes the teeth to be cared for. Then, as any pits or fissures show the least sign of becoming carious, small fillings can be inserted of copper amalgam, silver amalgam or cement. I prefer copper amalgam or copper cement because of their germicidal efficiency.

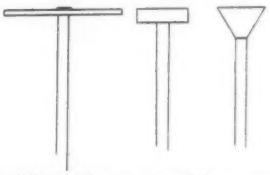


Fig. 5.—Mounted stones used in preparation.

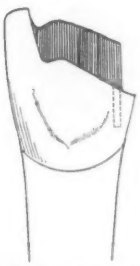


Fig. 6.—Lingual view in cavity preparation.

Frequently, a banded gold crown may be made to cover the exposed tooth until the child is older, no enamel, of course, being removed. This is done to restore the occlusion to its correct height. This crown should be removed later and a better type of restoration placed. Various types of castings are indicated, this depending on the extent of the deformity.

Figure 3 shows a type of restoration suggested by George M. Hollenback. The occlusal surface is smoothed with stones into some semblance of cusps and grooves, the operator keeping away from the pulp. A finishing line is established in sound enamel. An amalgam die is made of the tooth and a thin piece of pure gold is swaged over the occlusal surface. To this, wax is added, until the proper occlusion is developed and the wax extended to the finishing line. The wax pattern is invested, burned out and cast. The inlay is then cemented to place.

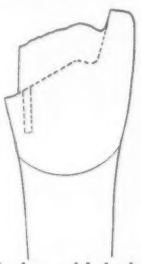


Fig. 7.—Labial view with incisal preparation.

Fig. 8.—Platinum matrix adjusted on amalgam die.

BROKEN INCISAL FRACTURES

Since, in 1933, I presented a paper[1] in

1. Hogeboom, F. E., and Hobbs, A. G.: Broken Incisal Tips, J.A.D.A., 20:1074 (June) 1933.

which I have covered the fundamentals of this problem, I shall supplement my observations there with certain technic variations.

Figure 4 shows a fractured upper central incisor from the lingual view, the fracture on an upper usually extending farther gingivally than on the labial aspect owing to the direction of the blow.

Figure 5 shows the small mounted stones and Joe Dandy disks used in preparing the tooth for a permanent restoration.

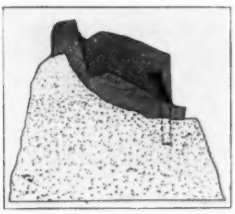


Fig. 9.—Platinum matrix mounted in high-fusing investment.

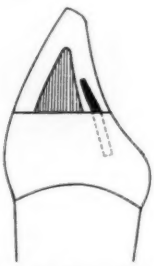


Fig. 10.—Cross-section showing porcelain baked to platinum pin and mounted on die.

Figure 6 is the lingual view of the preparation. The position of the post is as far away from the pulp as possible. There is a slight "hook" at the junction of the unbroken part of the incisal edge. The flat seat on the interproximal part and this "hook" keep the filling from turning on the pin.

Figure 7 is the labial view, showing the incisal preparation. The "hook" and flat seat on the proximal wall near the pin hole may be noted.

In Figure 8, an amalgam die has been made. On it, platinum foil is swaged and the platinum pin is placed in position. Sticky wax is added to the entire matrix, covering the pin and the apron to about 1 mm.

In Figure 9, the entire wax crown and matrix, including the pin, has been removed and mounted in McBean's high fusing investment and then brought up to 2200 F. in the furnace.

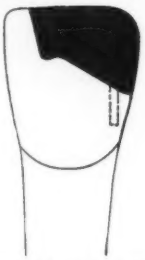


Fig. 11.—Lingual view showing wax pattern carved.

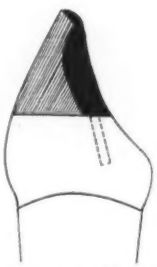


Fig. 12.—Cross-section of tooth showing porcelain ground and wax backing carved to place.

Figure 10 shows how, after the mass cools, porcelain of the appropriate shade is baked.

Figure 11 shows the grinding away of the lingual portion of the finished porcelain corner and the waxing up of a backing. The porcelain can be finished and cemented to place as outlined and discussed

in the paper previously mentioned. If added incisal strength is required a gold backing can be made.

Figure 12 shows a cross-section of the tooth with the porcelain inlay ground to position and the wax carved to place and slightly covering the incisal edge.

Figure 13 shows the gold backing cemented to place and the porcelain inlay cemented in the backing. The wax pattern is carefully withdrawn, with the pin in place, and cast. It is well to hollow out under the "hook" portion of the porcelain before the wax pattern is made so that a thin edge of gold may grip over this point for added retention.

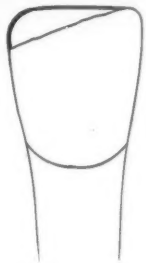


Fig. 13.—Porcelain in place, backed up by gold.

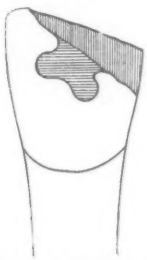


Fig. 14.—Lingual dovetail cavity preparation for gold backing.

Figure 14 shows how a dovetail preparation is made to hold the gold backing. This is frequently used instead of a pin attachment.

Figure 15 shows how the wax pattern is made with a window hollowed out to receive a porcelain inlay or a silicate filling.

Figure 16, a cross-section, shows the wax pattern seated in the lingual dovetail, with the window carved to receive the porcelain or silicate restoration.

Figure 17 is a labial view, showing the porcelain or silicate filling in place, with a slight band of gold showing on the incisal aspect. This can be reduced to the minimum if care is used in outlining the box formation.

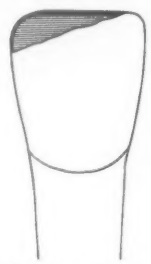


Fig. 15.—Labial view showing wax pattern with window carved out.

Fig. 16. Cross-section showing wax pattern with window carved for porcelain or silicate.

Figure 18 shows a fractured lower incisor, which presents a more difficult problem in some ways because of the bite. The fracture usually runs from near the incisal edge, down on the labial aspect either in the mesial or the distal direction. Porcelain, without a strong backing, is out of the question in a great many of these cases.

Figure 19 shows a soldered gold band.

For a young child, I often make such a band of some strong orthodontic material, fitting it snugly to the tooth. I then wax up the broken corner with the band in place, remove the band and wax, invest and cast. This will take care of the biting stress and last until the child is old enough for some other type of restoration.

Figure 20 is from a recent case. A few weeks ago, I was presented with the difficulty of caring for a broken lower lateral incisor, partially erupted. Luckily, the pulp was not exposed, but the break was flush with the gum line. First, I used phenol in the tooth and painted a little permanent cement over the tip. I then fitted a copper band as best I could and took an impression, forcing the compound clear under the gum. I was able to get about 2 mm. all round. The amalgam die was made and, with platinum substitute, a matrix was swaged. A thin coating of inlay wax was painted on this, and the matrix invested, heated and cast. This gave me a perfect fitting covering with a minimum of gold, which I cemented to place.

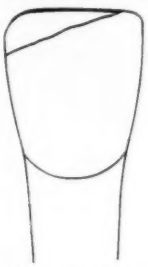


Fig. 17.—Labial view showing porcelain or silicate in place.

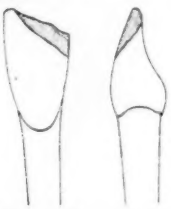


Fig. 18.—Fractured lower incisor, labial and cross-section view.

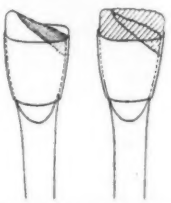


Fig. 19.—Left, gold band fitted to tooth. Right, band in place, with wax carved to restore tip.

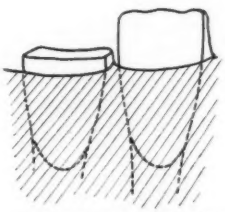


Fig. 20.—Broken lower lateral incisor, partially erupted. A platinum substitute matrix is used.

I have touched on only a few of the many problems which arise in daily practice, but they may suggest some avenue out in the everyday handling of restorations for children.

HEALTH CLUBS AS APPLIED TO DENTISTRY

By CHARLES RIDER, D.D.S., Imperial, Nebr.

IT will be my endeavor to present one phase of dentistry from an entirely new angle, i.e., children's dentistry, and from the angle of educating children in dentistry by means of dental health clubs. Our clinic is practical not only for the child specialist but for the man in general practice as well, and it will work in the small town as well as in the city office.

Did you ever have a patient come into your office and say, "Good morning doctor. I wish to have my mouth examined. I was taught the value of my teeth and their relation to my health. I was likewise taught that 60 per cent of the work to be done was hidden from the dentist's view, so I want my mouth examined by the x-rays to detect interproximal cavities, and all other hidden conditions that might exist. If any cavities are present I want good gold inlays, with linings under them, and all grooves carried out for the prevention of further decay."

Life would be worth living again, if we had a clientele composed of patients like that, and dental practice would be a pleasure and not an effort. It would not require hours of talk at the chair to convince patients of the value of good dental service, for the foregoing is certainly proof that the patient had been dentally educated earlier in life.

You may say that to educate the public to this extent would be wonderful, but impossible. But such a state of affairs is not impossible, and, best of all, it is not a difficult task to bring it about.

Certainly we need some sure methods of imparting dental facts to the public, when we take into consideration the fact that from 75 to 90 per cent of school children need dental attention, and only a small percentage of the work reported at the school health examinations is ever done. We know that this situation is not due to lack of parental interest or parental love; neither is it always due to a lack of funds. Rather, much of it is due to a lack of dental knowledge. If these parents had been educated, when young, to the value and necessity of sound teeth and their assurance of better health and greater efficiency, surely they would demand more and better dental work for their children.

But it is impossible to sell anything to the public if they do not have some knowledge of it. If the radio and car manufacturers, the silk hose and fur coat establishment, made no more effort to educate the public to an absolute need for their products than the average dentist does as to what he has to offer, they probably would all have been bankrupt years ago. The tooth paste and mouth wash manufacturers have done far more to advertize dentistry and arouse the public to an interest in dental health than has the dental profession itself. We are today facing conditions different from those of five years ago, and we cannot increase our practices these days by sitting in our offices waiting for business to come. Instead we must do things. It is time that we individually become active and do something to educate the public in our own respective communities

to better dental care. Our practices will increase in proportion to the dental knowledge we convey to the public, as I shall prove.

Why are so many electric refrigerators being sold today when only a few short years ago they were unknown? Because the manufacturers educated the public, until today we feel that an electric refrigerator is not a luxury, but a necessity to good health. Soaps are sold through appeal to the health; and we eat certain breakfast foods for better health. The other day, I saw a sign over the entrance to a bowling alley: "Bowl for your health." If such things are sold through an appeal to the public interest in health, surely our profession can convince the public that it pays to invest in expert dental care, for we are "selling" something that insures longer, happier and healthier lives.

But this can be accomplished only when we become teachers as well as professional men, and educate our patients to the full value of their thirty-two priceless teeth and their relation to ill health. The place to begin educating is with the children.

There is far too large a gap between the dentist and the patient, and what the dental profession knows about the growth, care, loss and restoration of teeth is far beyond what the public knows. Until this gap is narrowed, 40 per cent of the school children will continue to fail in their examinations; 2 per cent will continue to have heart trouble, and from 75 to 90 per cent will continue to need dental attention. Not only that, but $250,000,000 will still be spent yearly on hair bobbing and permanent waves; $500,000,000 on patent medicines; $800,000,000 on cosmetics and beauty treatments, and only $200,000,000 on dentistry, or the same amount that is spent on pop and soda water each year. We should be ashamed of ourselves as dentists to let the soda fountain clerk, the barber and the beauty parlor operator outsell us, and all I can say is that we are poor business men, and the whole situation is due to failure of the dentist to interest the public in dental health and thus narrow the gap between dentist and patient.

I have been able to lessen this gap considerably in my own practice, making contacts with the public through children's dental health clubs.

More than four years ago, I began mapping out a definite line of educational procedure, whereby we could teach children the value of dental health. To compile the material and devise a definite system of teaching required two years.

More than two years ago, I put the plan into actual practice, and it works beautifully and effectively.

I sent out written invitations to about thirty-five children, aged 10 to 14, to attend a party that I was giving. At this party after a social hour was over, with refreshments served, I explained to them that I intended organizing a dental health club, which would meet every Saturday morning at 9:00 o'clock at my office. By the use of pictures, charts and models, we would study the teeth, as to proper brushing, proper foods, home care of the teeth, care by the dentist, use of the x-rays, results of neglect of the teeth, how to build strong bodies and teeth, what causes tooth decay, general information regarding both the temporary and the permanent teeth, the first permanent molar, the third molar, modern dental care, cheap dental care and its ill-effects, and many other interesting illustrated talks on health. I told them that the club would elect its own officers, such as president, vice president, secretary and treasurer, and they would carry on their own business meeting each Saturday

morning. It was also explained that we would have many activities, such as social parties, theater parties, trips to other towns and picnics, besides having a social period every Saturday morning after the club meeting, when we would have contests and play games.

After telling these children that we would divide the hour each Saturday into three parts: business meeting, twenty minutes; health talk, fifteen minutes, and social time, from twenty-five to thirty minutes, I asked how many would care to join such a club. The vote was unanimous and the first meeting called for the next Saturday morning.

In the meantime, I presented the plan to several of the teachers. Happily for us, they were all greatly interested in the plan, and promised and gave their whole-hearted cooperation and assistance.

The club was started the next Saturday, at which time the members elected their officers, named their club "Health Crusaders" and chose their colors, red and white, with one half the members on the red side and the other half on the white side. The two sides run a continuous toothbrushing contest of thirteen week periods. Every thirteen weeks, the losing side gives the winners a party or a picnic.

The club members have uniforms of white shirts, white trousers and red ties. They have a photograph album containing a history and picture of each club member; also a scrapbook made up of dental and other health articles from magazines and daily papers.

We also have a club among thhe children from 7 to 11 years of age. They named their club the "White Pearl," and their colors are orange and black. These younger children are just as enthusiastic and interested as the older ones.

We even have a health club in two rural schools, 10 miles from town. These are named the "Health Bound Club." The members appreciate the value of dental health so much that when they sell a pig or a calf, they first use the money to have the teeth cared for, and then with what is left, they think of buying clothes or luxuries. Children are the same the world over, and any of them can be taught the value of dental care regardless of where they live: city, small town or rural district.

The clubs have met every week since the first Saturday, which was over two years ago. The attendance has been regular and the enthusiasm high. Every member has averaged brushing the teeth more than thirteen times a week since the club started. Through the weekly health talks, the members now have a good general knowledge of the value of dental health: they know the value of their teeth, the proper care of them and the relation of their teeth to ill-health. Practically every one of them is on the six month call list and 90 per cent of them are Gold Star Members; that is, they have their mouths in perfect condition. The club work has almost entirely eliminated all fear of the dental office, and when that is accomplished, children are our best patients. Rarely do I have to remind any of them to have their teeth checked. In nearly every case, they ask for an examination every few months. Think what desirable patients they will make as adults, and when they have children of their own, they will pass on the story of dentistry. The greatest satisfaction that I have derived from this work is the friendship of and association with these children, and the knowledge that they are absorbing facts regarding their teeth and health that will mean more to them in the future years than riches and jewels.

I wish to give you some actual figures as to what has been accomplished in the

schools in a year's time. A year ago, at the school health examination in one room, 75 per cent of the pupils needed dental attention. This year, but 25 per cent needed dental services. Not only that, but when the pupils were asked how many had the teeth examined regularly by a dentist, 40 per cent raised their hands.

At a recent mouth examination, we divided a group of students into three classes, as follows: Class I, or those who admitted that they had no regular dental examination; Class II, or those who had examinations regularly at six-month intervals; Class III, or those who were members of our health clubs. The examination disclosed the fact that the health club members had nine times as many O.K.'s, or perfect mouths, as those on the six-month call list, and twenty-five times as many O.K.'s as Class I, or those who had no regular dental examinations. This in itself should be convincing proof of the good accomplished through educating children by means of health clubs.

Can any one doubt that a six-month call list will reduce dental defects, and that a health club is still more effective than the call list? The two make an effective and happy combination, and the plan works just as well if not better for the general practitioner than for the child specialist.

If every dentist would educate seventy-five children a year as to the value of dental care, think of the millions of people yearly that would be made interested in dental health. In five years, the practice of dentistry would be entirely revolutionized and it would become a pleasure. Think not only of the ideal adult patients these children will be, but also of the little friends they will bring to your office, to say nothing of their influence on their parents and their adult friends. Think of the solid foundation upon which you are building a future practice: 36 per cent of the business in my office comes from the six-month call list and club members. Not only is this a new procedure in practice building, but isn't it worth something to have that feeling of satisfaction that comes from knowing that you have been responsible for making the children in your community healthier, happier and more alert, thereby fitting them better to cope with life's battles?

Meet with these children and be one of them one day a week. They will take just as much interest in you as you take in them. You will find them the best little boosters and the truest friends that you ever had.

I have brought a representation of our health clubs from Nebraska—almost a 2,000 mile trip—to prove to you beyond a doubt that the public can be educated regarding dental care through the children. What these children can do is no more than the remainder of our seventy-five club members can do; neither is it any more than the children in your own localities can do if you will but spend one or two hours a week with them.

I wish to introduce to you a few representatives of our clubs: Miss Joan Peyton, fifth grade, aged 9 and Mr. Donald Rider, fifth grade, aged 10; both of the White Pearl Club; and Miss Anne Reichardt, eleventh grade, aged 15 and Mr. Robert Mohr, eleventh grade, aged 15; both of the Health Crusader Club.

QUESTIONS

(White Pearl)

1. What is the proper motion for brushing in the teeth?
2. Do you brush away from the gums or against the gums?
3. How often should the teeth be brushed each day?
4. At least how many times should each

surface of the teeth be brushed? How many minutes should they be brushed?

5. In using the toothbrush, five parts of the mouth should be brushed. Name them.

6. After brushing how do you clean between the teeth?

7. How often should the teeth be examined by the dentist?

8. Name some cleansing foods.

9. Name three good vegetables. How often should they be eaten each day?

10. Name three good fruits. How often should they be eaten each day?

11. How can you exercise the teeth?

12. Name three fibrous foods.

13. If you eat candy, when should it be eaten?

14. At what age should the child start going to the dentist?

15. How many teeth in the baby set?

16. By what other name do we call the baby set?

17. Do the baby or temporary teeth have roots?

18. What becomes of these roots? Explain how they absorb.

19. Name the three parts of the crown of a tooth.

20. Should the baby or deciduous teeth be filled and saved? Name four reasons.

21. Name the deciduous teeth in the order in which they are arranged in the mouth.

22. Name them in the order in which they erupt or come in.

23. How many teeth in the permanent set?

24. At what age do the first baby teeth come in?

25. How old is the child when all twenty of the deciduous teeth are in place?

26. At what age does the first permanent molar erupt?

27. By what other name is it sometimes called?

28. What is the name of the second permanent molar? At what age does it erupt?

29. How much of the tooth is above the gums?

30. Can the dentist see all this top third when examining the teeth? Why not?

31. What hidden condition might be present in this top third?

32. How may these hidden conditions be found?

33. By what name are x-ray films called that are used to find interproximal cavities?

34. How often should bitewings be taken?

35. How much of the tooth is hidden below the gums? Four conditions that might be present.

36. I am going to put in a filling in the occlusal or biting surface of a lower molar, at the point where the four deep grooves meet. If I round out a little cavity at this point and put in my filling, is the tooth properly filled? Why not? What difference does it make if the deep grooves are not carried out?

HEALTH CRUSADERS

1. What percentage of school children of the United States have defective teeth?

2. What percentage of people use the toothbrush?

3. What percentage of the school children fail to pass their exams? What per cent could this be lowered if every school child had good teeth?

4. What disease is now first in the United States in cause of deaths each year? How many people die each year in this country from heart disease?

5. How many people die each hour in the United States?

6. How many of these deaths could have been prevented? Name two things that would have prevented many of these deaths.

7. What is a six-month call list?

8. What is the value of the six-month call list?

9. Does a small cavity in the enamel of a tooth indicate the exact size of the cavity?

10. What are the four stages of tooth decay?

11. Name five mouth conditions that neglect of the teeth may cause.

12. Is it possible for a tooth to be abscessed and still cause the patient no discomfort?

13. Name four causes of tooth decay.

14. Name four childhood contagious diseases that well kept teeth will help to prevent.

15. What is tartar? Where does it come from? What disease does it cause?

16. Can a dentist give a thorough examination with a mouth mirror and explorer? Why not? How much of the work is overlooked by the dentist who tries to examine without x-rays?

17. How much of the tooth is below the gums? Name four hidden conditions that may be present below the gums. How may they be found?

18. Name five diseases and bodily ailments that these conditions may cause.

19. How much could life be extended by proper examination and care of the teeth?

20. Would you want a dentist to work on your permanent teeth without first x-raying them? How often should one have a full mouth x-ray examination?

21. What minerals do milk contain? What part of the body does it build?

22. What do vegetables contain?

23. Name four conditions that lack of proper foods may cause.

24. In what foods are carbohydrates found? What is the use of carbohydrates?

25. Name four foods in which proteins are found. What is the use of proteins?

26. How many vitamins are there? Name them. Name two groups of foods in which they are found.

27. How many minerals are necessary for strong healthy bodies? Name five.

28. How many teeth in the permanent set? Name them.

29. What two teeth in the permanent set replace the first and second baby molars?

30. What is the most important tooth in the dental arch?

31. Would losing this tooth early in life have any effect on the rest of the teeth? What effect?

32. Why are so many six-year molars lost?

33. What price does the United States courts place on each permanent tooth?

34. If the wisdom teeth have not erupted or come through by the time the person is full grown, is it a sure indication that no wisdom teeth are present? What might the x-rays disclose?

35. Name four bodily ailments that an impacted tooth may cause.

36. What is orthodontia?

37. Name four causes of crooked or malposed teeth.

38. Name two habits that cause it.

39. How many classes of malocclusion are there? Name them.

40. Describe Class I; Class II; Class III.

41. Give three advantages of having the teeth straightened.

42. Define an antrum.

43. Define anterior teeth.

44. What is an abscess.

45. What is dentine?

46. Define mastication.

47. What is the maxilla?

48. Define "mandible."

The club members and I sincerely hope that you have been impressed with the countless possibilities of this method of educating the children toward more and better dental care. We trust the plan and idea will be spread until it reaches the curriculum of every public school. A course of instruction to the senior students in our dental schools on how to organize and conduct health clubs when they enter practice might not be a bad idea. These children who are here this afternoon have gone entirely through our book of 150 pages, which deals entirely with teeth and their relation to ill-health.

Whenever the dentists educate the children in their own practices toward better dental care by means of health clubs, and when a complete course of dental instruction is put in our public schools, and taught by competent dentists, dentistry will attain its rightful place in the eyes of the public, the profession will be busy and happy, the advertiser will go out of business, panel dentistry will be forgotten and the United States will produce more robust, red cheeked, mentally alert children than any other nation on the face of the earth.

NATURE—BUILDER OF TEETH: A DENTAL HEALTH LECTURE

The Dental Health Lecture "Nature Builder of Teeth," which was shown as a sound motion picture in the Hall of Science at a Century of Progress, has been converted into a silent 16 mm. film and also into a stereopticon lecture.

The 400 foot film consists largely of animated drawings showing the growth of the teeth, jaws and face. A lecture which is synchronized with the pictures is furnished in mimeographed form.

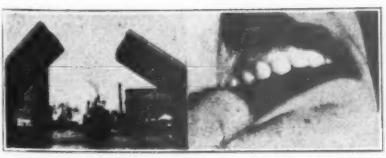
The stereopticon lecture is based upon the original film story. This lecture is printed in full below. Accompanying the lecture are twenty-eight key pictures taken from the original film, mounted on seventeen stereopticon slides.

"Nature—Builder of Teeth" in film or stereopticon form may be purchased or rented from the Bureau of Public Relations, American Dental Association, 212 E. Superior St., Chicago, Ill.

Film version, rental price, $1.00 per showing; $3.00 per week; plus express charges to and from Chicago. Purchase price, $25.00.

Stereopticon version, rental price, $1.00 per showing; $3.00 per week; plus express charges to and from Chicago. Purchase price, $6.00.

The Stereopticon Story



Smile and the world smiles with you. A cheerful smile is your greatest charm. All through life, no matter what your age, beautiful teeth are the mirror of your health.

Beginning with the new born baby, the foundation upon which Nature builds, the development of the teeth and jaws is one of Nature's remarkable feats of engineering.

When an engineer builds a jackknife bridge, there is a moment of suspense when the two arms are let down for the first time. Will they meet exactly as they should, or has there been a mistake in design or construction? No less amazing an achievement is the building of the teeth by Mother Nature.

The upper and lower teeth meet in just the right relation. What is the compelling force which guides their growth and movement, over a period of years, until finally they meet exactly as they should.

It is the purpose of this film to illustrate the development of the teeth and jaws and

the part they play in shaping the face. In the new born baby, most of the temporary teeth are already formed, as Nature has been at work on them for about five months.

Here is a view of baby's jaws at birth. The crowns of the baby front teeth are very nearly completed within the jaw bone. The crowns of the baby molars are partly formed. Behind the baby molars, there are two little specks, one in each jaw. These are the beginnings of the first permanent, or sixth year, molars.

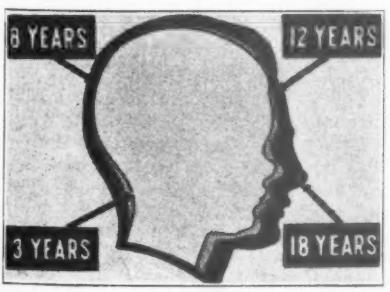
Watch these teeth grow during the first six months of baby's life. Notice the formation of the crowns and the growth of the roots, little by little. The crowns of the temporary teeth are almost completed, and the roots of the other temporary teeth are forming. The little specks which are to be the first permanent molars are also growing. The roots of the front teeth have grown considerably, and one of the lower incisors is coming through. Baby is six months old.

This is indeed a day of celebration, for the baby has its first tooth. The structure of the teeth depends largely upon the health of the baby, its food and its care during the nursing period and also while the teeth are being formed.

As this development progresses, the roots of the temporary teeth grow. These teeth are gradually pushing their way out. The lower teeth come through just a little earlier than the corresponding upper teeth. The first bits of enamel of other permanent teeth appear beyond the root ends of the temporary teeth, which they will later replace.

Follow closely the growth of the first permanent molars, as they are the most important of all the teeth. They are forming just back of the baby molars, and erupt behind them, as you shall see later. No baby tooth is lost when the first permanent molars come in. They seldom cause pain, and often are in their places without the knowledge of the child or the parent.

At about 3 years of age, all of the twenty teeth are in place. At this time the child should begin his regular visits to



the dentist for examination and attention. No more teeth will come through until the first permanent molars erupt.

As growth continues, new little specks appear in the upper and lower jaws. They are the second permanent molars starting their growth. Watch them enlarge as the years go by. The crowns of the other permanent teeth are increasing in size, especially the first permanent molars. Their crowns are about finished, and their roots will soon begin to grow.

Now another interesting phenomenon occurs. The roots of the temporary front teeth are being absorbed. This eventually happens to the roots of all the temporary teeth as the permanent teeth push forward.

As the temporary teeth come out, their permanent brothers take their places. The first permanent molars are through the gums. Their roots are lengthening, while the roots of the temporary front teeth are being absorbed.

We now have followed the development of the teeth to approximately 8 years of age. The upper and lower first permanent molars are in position, and a number of permanent front teeth have replaced their temporary predecessors.

Let us go back to the front view of baby's jaws at 3 years of age. The permanent front teeth are much larger than the temporary front teeth. Therefore, the jaws must enlarge to make room for them. Mother Nature provides for this. All of the temporary teeth are through the gums at 3 years of age. The crowns of the permanent teeth are partly formed in the jaw, and their development apparently causes the bone to expand to make room for them.

Watch baby's front teeth move apart as the jaw widens. This is a normal, natural, development, designed to make room for the larger permanent teeth. This process continues, the permanent teeth pushing closer and closer toward the surface of the gum. Finally, the temporary teeth loosen and come out, and the permanent teeth take their places.

The first permanent molars were in their proper positions back of the baby

molars at the age of 6. Let us observe another marvelous feature of Nature's skill. The points or cusps of the lower molars fit into depressions in the upper molars. They interlock. They establish and hold the relation of the lower jaw to the upper, while the baby teeth are being replaced by the permanent teeth. These teeth are frequently called the "keystones to the dental arch."

The roots of the remaining temporary teeth are being gradually absorbed, and the permanent teeth are developing. The second permanent molars are about to erupt, and will soon be in their proper positions. The roots of the other permanent teeth continue to grow. Some of them are already formed. The third molars (wisdom teeth) are advancing toward and through the gum. Nature is completing her masterpiece of engineering. Our child is 18 years of age.

But our story is not yet ended. Coincident with the development of these teeth has been the growth of the jaws and head. At 3 years of age, all of the available space in the jaw is occupied by the temporary teeth.

However, the first permanent molars apparently exert sufficient pressure on the temporary teeth to push them all forward, and the jaw moves forward with them. Thus, space is gained, and when they have finally erupted, the jaw is just as much longer as the width of the first permanent molars.

By this time, the second permanent molars are forming, and again there is insufficient room. They, in turn, push the other teeth forward, and the jaw is again lengthened. The wisdom teeth normally repeat the same operation, and the jaws are still further lengthened. Sometimes a wisdom tooth does not quite succeed in making room for itself, in which case it frequently causes trouble.

The outlines at 3, 8, 12 and 18 years show that the face has lengthened as the several permanent teeth have erupted. They demonstrate the part which the teeth play in making the lower half of the face broader, longer and more prominent.

The early loss of a single molar tooth often prevents normal development of the jaws.

We see here the results of Nature's efforts over a period of eighteen years. What a remarkable engineering feat she has accomplished! So far, we have been watching only the normal, natural development of the teeth, jaws and face. But it doesn't always work out that way.

Suppose the child was a bottle baby, and was not properly nourished particularly during the first year. The chewing surfaces of the molars, and the edges of the front teeth are defectively formed. These are the parts of the teeth that were formed during the first year. No amount of good food will correct these defects, once they have occurred.

Another child had scarlet fever when he was 3 years of age. Instead of smoothly formed enamel, there has been a failure of proper development in all these teeth. The enamel formed previous to the illness is perfect, but during the illness, the cells did not function properly, and the enamel is defective. This occurs in all of these teeth at the same time. After the illness, the enamel is again perfectly formed.

Sometimes Nature is unkind to us. A young person may have large blotches on the upper front teeth. This is called mottled enamel. It is caused by small amounts of fluorine in drinking water. These blotches may be yellow, brown or black and are often very unsightly. No means has been discovered for removing them.

Both of the lower first molars were extracted when a girl had reached 8 years and the chin did not develop as it should. The upper front teeth are very prominent. If her teeth had been properly cared for, the molars would not have been lost and her face would have been quite beautiful.

Our story is told. We have witnessed the wondrous development of the teeth from babyhood to adult age. Nature, Builder of Teeth, has shown us the wonder of her ways.

Baby's teeth are the foundation upon which Nature builds. Guard them well for they may affect the baby's health and appearance as it grows into manhood or womanhood.

CURRENT LITERATURE

Effect of Diets on Calcium and Phosphorus Metabolism in Dogs: Much excellent research has been directed toward the elucidation of the effects of special diets and of vitamins on the calcium and phosphorus metabolism. (Morgan, Agnes F., with the cooperation of others: The Effect of Acid, Neutral and Basic Diets on the Calcium and Phosphorus Metabolism of Dogs, Univ. of Calif. Publications in Physiology, 8:61, No. 7, 1934.) Morgan and her collaborators intended primarily to study pyorrhea, but it was felt that a comprehensive study should take account of the changes in bones, blood and excretions as well as of teeth and gingivae. The experimental observations were made on young dogs taken at weaning at the ages of from 5 to 7 weeks. . . . Clinical mouth examinations, blood examinations and roentgenograms were made once a month. The weights were recorded weekly. . . . The diets used consisted principally of casein, agar and sucrose, with the addition of salt mixtures of varying calcium and phosphorus content made alkaline, neutral or acid by the addition of sodium carbonate or ammonium chloride. Butter fat supplied vitamin A to those animals not receiving cod liver oil. Dried brewery yeast was given as the source of vitamins B and G. . . . The alkali-fed dogs were usually larger at every age than comparable animals on the other diets. A definite superi-

ority in growth rate was observed also in the animals given cod liver oil. The roentgenograms indicated nearly normal conditions of bones in the greater number of dogs given cod liver oil, and rickets of varying severity in those without vitamin D. The dogs on acid diets without vitamin D showed the most severe lesions, the alkaline dogs the next most severe; the neutral dogs were the most nearly normal of the group. . . . The low calcium group showed the most severe lesions of all, except the one animal that was given cod liver oil from the beginning. The low calcium dogs without cod liver oil were found to have developed osteitis fibrosa; the other vitamin D-free dogs, osteoporosis or osteomalacia. . . . No variations were found that could be ascribed definitely to reaction of diet, vitamin D, or stage of bone lesions. The organic phosphorus of the whole blood was lowest in the dogs on acid diets without cod liver oil and highest in the dogs on neutral diets both with and without cod liver oil. . . . It is concluded that paradentosis in varying degrees of severity as well as renal damage may result from the long continued use of alkaline diets either with or without vitamin D and normal calcium-phosphorus ratio and content. This work, combined with that of others, e.g., Mellanby (Mellanby, May: Medical Research Council, Special Reprint Series 153, 1930), provides a broad foundation for further research and attempts at clinical application.—Editorial, *J.A.M.A.*, Dec. 15, 1934.

Granulopenia Following Allonal (C. H. Stone and J. Margolis, J.A.M.A., Dec. 22, 1934): This is a case history. Because of insomnia, a physician had advised allonal. For six months, the patient took 2 tablets daily at bedtime. The present illness had its onset in May. In mid-June, the gums and throat became sore with swelling of the glands of the neck. Other symptoms typical of the disease were present. Blood transfusions were resorted to. In July, the allonal was stopped. Pentnucleotide and liver extract were injected every other day until the patient was dismissed from the hospital in August. Clinically, the patient began to improve a few days after the allonal tablets were discontinued.

Human Milk Studies (Barnes, Cope, Hunscher and Macy, J. Nutrition, December, 1934): The study group named say that neither human milk nor cow's milk can be relied on always to protect babies against rickets. Twenty-six per cent of breast fed and 56 per cent of formula fed babies living in Detroit have rickets. Laboratory tests have shown that ordinary breast milk is a poor source of vitamin D. Human milk fed to a rat did not protect it against rickets. There is a tendency at present to exaggerate the protective value of breast milk. Clinical proof does not support the advertising claims of today in this regard. An experiment is described and tabulated in the article and the following summary given: "A woman whose diet was superior in quality and, in addition, was fortified with 2 quarts of cow's milk daily in which 300 units of a vitamin D concentrate of cod liver oil were incorporated was unable to secrete a breast milk that was sufficiently enriched with vitamin D to heal rickets in three colored breast-fed infants or in experimental rachitic rats. Her own breast-fed baby, however, showed no signs of rickets throughout the investigation."

Biologic Reactions to Ethylene Anesthesia: A Résumé (Arno B. Luckhardt, Anes. & Anal., May-June, 1934): This résumé is the result of a statement in the September, 1933, *Colliers* that, of the inhalation anesthetics, nitrous oxide is far safer than the others. Statistics were given for nitrous oxide, ethyl chloride and chloroform, but ethylene was not mentioned. Luckhardt comes to the defense of ethylene. When first presented, it was not overacclaimed. Rather, its defects were pointed out. It did not take the field without opposition. In a short time, it increased the interest of anesthetists and surgeons in gas anesthesia. It showed that postoperative pneumonia, ether nausea and gas pains were unnecessary. It met with the usual human stubbornness and unfairness. Reports of accidents were published, while those associated with ether or nitrous oxide

anesthesia were suppressed. Incidents in proof of this statement are narrated. The supreme danger of the nitrous oxide-oxygen-ether combination is pointed out. With the same amount of skill, it is easier and less dangerous to the patient to give ethylene than nitrous oxide, since more oxygen can be given with ethylene.

Branchial Cyst: I have under my care a full term normal male infant about 3 weeks old. At the age of 3 days, a swelling was noted at the angle of the jaw on the right, anterior to the sternomastoid muscle. The swelling appeared to be subcutaneous and cystic and continued to enlarge. Aspiration was done after two weeks and 10 c.c. of straw colored fluid was removed. The cyst is probably branchiogenic in origin. What treatment would you advise? If you advise a sclerosing agent, which should be employed? The maternal grandmother states that the mother had a similar condition in infancy, which disappeared spontaneously. A brother of the mother also had the same condition, but died in infancy. A 2½ year old sister of this patient has a cleft palate and club feet and is feebleminded. *Answer:* From the description and location, the diagnosis of branchial cyst is probably correct. The treatment of such conditions with caustic and sclerosing agents is unsatisfactory and not recommended. If the cyst is quite superficial, as seems likely, excision is not difficult and is desirable. Deeper cysts or fistulas of branchial origin require greater skill for their successful removal. Superficial cysts and fistulas of this group may eliminate themselves if an external opening is maintained. As long as the swelling does not increase, there is no hazard in delay, although spontaneous cure is hardly to be expected.—Queries and Minor Notes, *J.A.M.A.*, Dec. 15, 1934.

Possible Tuberculous Ulcer of Tongue: I have a patient who has moderately advanced pulmonary tuberculosis. There is also some slight laryngeal involvement, but no ulceration that I have seen. Several months ago, this man had a sharp tooth on which the tip of his tongue became cut very slightly. The tooth has been taken care of, but an ulcer has formed at the tip of the tongue where the small cut was. He had the ulcer three or four months previous to his visit to me. I am in doubt just what steps I should take in the treatment of this lesion. Should I leave it alone? Should I cauterize it? If so, with what? If left alone, what will be the ultimate outcome? *Answer:* Because of the presence of pulmonary tuberculosis, the possibility of this ulcer being tuberculous should be seriously considered. Examination of smears made from the floor of the ulcer for the tubercle bacillus should be done, or a piece of the ulcer removed by biopsy may be examined by a pathologist for tuberculosis. If the diagnosis of tuberculosis is sustained, the lesion should be removed with the actual cautery or by excision, the wound being closed with sutures. If not removed, the tuberculous ulcer of the tongue tends to spread, becomes very painful and, in its later stages, offers a serious prognosis. Removal by excision or the cautery is probably wise even though a diagnosis of tuberculosis is not made.—Queries and Minor Notes, *J.A.M.A.*, Dec. 15, 1934.

Burning of Tongue and Canker Sores: A widow, aged 45, an American, complains of burning and painful tongue of about four weeks' duration. Original examination disclosed an irregular grayish area about 15 by 5 mm. in size on each side of the tongue at about the area of the molars. Although there is no infiltration present, I have diagnosed these to be leukoplakia. In addition, the patient complains of some burning arising from several small fissures on the dorsum of the tongue near the tip. Physical examination is essentially negative, with the exception of a moderately acid reaction in the mouth and a faint albuminuria. The patient has been referred to a dentist, who removed any dental irritations present. There has been some subjective improvement on alkaline therapy, which changed the salivary reaction to the alkaline side, and the use of one-half strength alkaline aromatic solution twice

daily. In the past few days, I have noted a new feature; namely, a small ulcer about 2 to 3 mm. in diameter located just proximal to the left leukoplakia. May I have your suggestions as to diagnosis and treatment? *Answer:* It is assumed, though not specifically stated, that there is no infiltration in connection with the small fissure mentioned. If this is true, the condition is probably a mild form of scrotal tongue, a congenital malformation. Burning sensations in connection with such fissures are most often neurotic. The small ulcer, if it has no infiltration of its border, is most probably a canker sore and should clear up after cauterization with a crystal of silver nitrate. Canker sores occur frequently from slight digestive disorders, sometimes apparently as a sensitization to some food. Some consider them a form of herpes simplex; but that has not been proved. The treatment mentioned is excellent. Great care should be taken not to frighten the patient by discussing the possibility of cancer, unless it is necessary in order to obtain her cooperation. Many patients, particularly women, with this symptom complex are cancer phobes, and their fear should be allayed as much as possible, the physician assuming the responsibility, by frequent examinations, of detecting any tendency to infiltration at its incipience, and giving prompt and energetic treatment.—Queries and Minor Notes, *J.A.M.A.*, Dec. 22, 1934.

Care of Teeth in Pregnancy: Will you please give me the latest theories regarding the protection of the mother's teeth during pregnancy: (1) any drug to be given; (2) any special articles in diet? *Answer:* It is important for every expectant mother to have her teeth examined and cleaned at least twice during her pregnancy. If the dentist finds defects that he can remedy, he should not do more than is absolutely necessary. He may fill (using temporary fillings), clean and pull teeth, but not make gold fillings, inlays or bridgework, which require a long time and which cause a good deal of discomfort. In many pregnant women, the teeth decay and loosen and, in practically all of these women, this abnormal process may be corrected by eating an abundance of calcium (chiefly in the form of milk), phosphorus (chiefly in the form of eggs), cod liver oil, halibut liver oil, viosterol, fresh fruits, vegetables, butter and whole grain cereals. These foods will help not only the mother's teeth, but also the teeth of the unborn child. Likewise an abundance of sunshine is essential in order to enable the body to utilize the calcium and phosphorus that are eaten. The teeth should, of course, be carefully brushed at least twice a day and dental floss used to remove particles of food lodged between the teeth. If the gums have a tendency to bleed, they should be vigorously massaged with the fingers two or three times a day. Many obstetricians prescribe as a routine the daily use of halibut liver oil with viosterol during the entire period of pregnancy. In addition, pregnant women are advised to drink a quart of milk a day in order to be certain that they secure enough calcium.—Queries and Minor Notes, *J.A.M.A.*, Dec. 22, 1934.

Relation Between the Physical Characteristics of Food and Dental Caries in Rats (Lilley and Willey, J. Nutrition, 7:463, 1934): The authors tried various diets, sometimes including coarse corn meal, and found that 66 per cent of the rats had caries in 100 days and 100 per cent showed caries in 125 days. They conclude that the physical form of food, not the calcium or phosphorus, is responsible for the production of dental caries. They verified their results by softening the meal, by cooking or grinding fine, and found no caries.

HAROLD C. HODGE.

The Problem of Radiosensitivity (Max Cutler, J.A.M.A., Oct. 20, 1934): Complete sterility of a tumor may be accomplished by: 1. Selective radiation which sterilizes tumor cells but does not kill normal cells. The radiosensitive tumors so treated include the carcinomas arising from the epidermoid structures of skin and mucous membranes. 2. Caustic radiation which causes radionecrosis of surrounding tissue. Radioresistant tumors so treated are adenocarcinoma, melanoma, osteogenic sarcoma, fibrosarcoma, etc. The radiosen-

sitivity of a tumor does not indicate its curability.

M. K. HINE.

A Consideration of Anesthesia for Impacted Teeth (Frank W. Rounds, Anes. & Anal., 12:85, 1934): Local anesthesia does not universally fulfil the requirements as an anesthetic for use in the removal of impacted teeth. It cannot be used if trismus or ankylosis is present. Inflammatory or suppurative conditions and acute pathologic manifestations in the area absolutely contraindicate its employment. Psychic shock is greater and postoperative complications are more frequent. The author recommends as a general anesthetic nitrous oxide and oxygen. If ether is to be utilized, the patient should be hospitalized. The odor of ethylene is frequently the cause of nausea and its prolonged postoperative analgesia makes it undesirable for office practice.

A. D. BRASHEAR.

Formation of Intercellular Substance by the Administration of Ascorbutic Acid (Vitamin C) in Experimental Scorbutus (V. Menkin; S. B. Wolbach, and M. F. Menkin, Am. J. Path., 10:569, 1934): Working on the belief of Aschoff and Koch that the primary deficiency in scurvy is a lack of intercellular substance and the demonstration by Wolbach and Howe that the administration of orange juice causes prompt deposit of intercellular substance, the authors gave crystalline ascorbutic acid, extracted from lemon juice, to guinea-pigs and made histologic observations. The animals were administered from 3 to 15 mg. per day for from two to fifteen days after the onset of ascorbutic symptoms and were then killed. Histologic studies were made on the incisor teeth and the costochondral junction, and it was observed that new dentin was formed after the treatment. It had been observed that in scorbutic guinea-pigs there is a separation of the dentin and the odontoblastic layer. They found the new dentin formed in proportion roughly to the amount of ascorbutic acid administered. The authors conclude that ascorbutic acid and vitamin C are indistinguishable and that the intercellular substance seems to be under the control of that acid by virtue of its oxygen-reducing properties.

HAMILTON ROBINSON.

Osteopetrosis (Thomas Shallow; Warren B. Davis and John T. Farrell, Ann. Surg., 100:512, 1934): Forty-nine cases of this condition, which has been variously termed marble bones, lime gout, etc., have been reported since 1904. Calcium metabolism is undoubtedly imbalanced, but the exact etiology is obscure. The authors report a case of a 15 year old, anemic, poorly developed white female with a disproportionately large head. The dentition was irregular and of poor quality. Roentgen-ray examination showed all bones to be of increased density. The mandible was exposed through an opening under the chin and it showed no normal dental structure. A month after admission, the entire mandible came through the opening as a large sequestrum during the dressing of the wound. No bleeding followed and two months later the opening was closed surgically. The patient has shown general improvement over a five month hospitalization.

HAMILTON ROBINSON.

FOREIGN LITERATURE

Administration of Anesthesia to Children During Sleep (W. R. Somerset, Lancet, Sept. 1, 1934): The child is put to bed at its usual hour, receiving from ½ to 1 grain of luminal. In about two hours, the anesthetist and assistants enter the room and the hands of the child are grasped and ethyl chloride administered for induction. There is always a brief struggle. The next morning, no mention is made to the child of the operation and the child never states that anything occurred the previous night. Some even express surprise that teeth have "fallen out" or that bandages are in place. The children never show alarm or suspicion that an anesthetic was used.

HAMILTON ROBINSON.

Hemostatic Possibilities of Snake Venom (R. G. MacFarlane and B. Barnett, Lancet, Nov. 3, 1934): The venoms of various poisonous snakes were collected

and their effect on hemophilic blood from three donors of established family and personal history was measured with a mechanical coagulometer. Venom from *vipera russellii,* an Indian snake, clotted hemophilic blood in seventeen seconds as compared with thirty-five minutes spontaneous clotting. A 1:10,000 or 1:100,000 dilution of this venom produced a clot within sixty seconds. The clot was tough and elastic. The toxins of the venom are ineffective in these dilutions. The venom can be kept in a dry state for many months and sterilization is accomplished by passage through a Berkefield filter. The venom has been used to control bleeding from operations and dental extractions in normal and hemophilic patients by local application in 1:10,000 dilution.

HAMILTON ROBINSON.

Use of Diathermy Knife in Malignant Disease of the Mouth, Nose and Pharynx (Norman Patterson, Lancet, Sept. 22, Oct. 1, 1934): A current of high frequency (from 500,000 to 1,000,000 per second) is passed through the tissues, producing heat. The advantages of diathermy in surgery are the control of hemorrhage, avoidance of cell implantation, destruction of tissue beyond the incision and complete sterilization. The results of 109 operations on the tonsils, soft palate, faucial pillars, tongue, floor of mouth, lower alveolus, cheeks, etc., are reported. In carcinoma of the tongue without gland envolvement, 50 per cent of the patients lived over five years after operation, while no patients having tongue and floor of the mouth involvement lived over five years after operation. This group showed the greatest variation. The glands were treated by irradiation. Of all the patients, 25 per cent were still living five years after operation.

HAMILTON ROBINSON.

Radium Necrosis of the Mouth—An editorial note in the *Lancet* (November 17, p. 1115) deals with the subject of radionecrosis and the discussion which took place at the Australian Cancer Conference. "Late radium necrosis," it states, "is frequently seen in the mouth, and is most likely to occur if two treatments have been given, or if needles have been inserted close to bone. As soon as the surface epithelium breaks down, infection is inevitable; or infection through an abrasion or following the extraction of a tooth may precipitate a very acute necrosis with sequestration of bone, sloughing of the soft parts and hemorrhage." Usually when bone is involved, palliative treatment only is possible. "In this case it is better to leave the bone to separate, because, if part is removed, the necrotic process will spread rapidly through bone which, before the interference, had appeared to be quite healthy. Treatment is so difficult that it is better to direct attention to prevention, although in certain cases where the disease has already attacked bone, some necrosis is inevitable.—News and Notes, *D. Rec.,* December, 1934.

Barbiturates in Epilepsy (R. Handley, J. Ment. Sc., July, 1934): Handley shows that an epileptic patient may receive temporary benefit from any new form of treatment. When this ceases, an impression is obtained that tolerance is established; but this is not true tolerance. The real explanation of this temporary improvement is found in the mental attitude of the patient himself, who responds, but only for a time, to any form of treatment. After an exhaustive test, it was shown that phenobarbitonum solubile (B. P.) is the best drug for general use in an institution. Phenobarbitone reduces greatly the incidence of "jumps," serial epilepsy, prolonged clonic convulsions and status epilepticus; but, with the exception of the first, once these conditions have begun, they are not benefited by the drug, unless it is given in large soporific doses. In spite of warnings against prolonged medication, patients are reported who have taken daily therapeutic doses for periods up to twelve years. No sign of mental deterioration is produced, and many are improved markedly. Although it is the custom when withdrawing the drug to do so gradually, the author's practice of sudden complete withdrawal has never been accompanied by any

unpleasant symptoms. The evidence that he has obtained supports strongly the opinion of French and German authorities, who say that no craving is established. An idiosyncrasy to phenobarbitone may occur, but the author has found that it never has occurred with the soluble alkaline drug. Most people agree that, even if idiosyncrasy occurs, ample warning is given. Emphasis is laid on the importance of suitable environment if epilepsy is to be treated successfully. The possibility of danger in phenobarbitone treatment has been exaggerated greatly and the severity of toxic symptoms magnified. The drug has undoubtedly diminished the incidence of serious sequels, and a patient becomes brighter and more equable when under its influence.—*J.A.M.A.*, Dec. 22, 1934.

Tumors of Parotid Gland (A. Hintze, Arch. f. Klin. Chir., Sept. 21, 1934): Hintze reports 116 cases of parotid tumor observed at the surgical clinic of the University of Berlin between 1912 and 1933. Classification of parotid tumors on a histologic basis presented certain difficulties, since pathologists are not always agreed as to whether carcinoma or sarcoma is present and at times are unable to state definitely whether the tumor is benign or malignant. The surgeon must keep in mind the ever present possibility of malignant degeneration of a previously benign tumor. The author believes it advisable to consider malignant the so-called mixed tumors. The cylindromas, which may be either benign or malignant, are considered as a separate group. Of the fifty histologically proved malignant conditions of the parotid, there were fourteen carcinomas, sixteen sarcomas, three not clearly differentiated between carcinoma and sarcoma, twelve mixed tumors, four cylindromas and one lymphoma. Of twenty histologically proved benign tumors, fifteen belonged to the mixed group and three to cylindromas, while two were simple benign tumors. The author emphasized the fact that not an inconsiderable proportion of the mixed tumors are malignant. About one third of the histologically proved malignant cases had a long history suggesting malignant transformation of an originally benign tumor. The author sees in irradiation a powerful adjuvant to surgical therapy. He reports 45 per cent of five-year survivals in the malignant cases, of which 21 per cent were symptom free at the end of this term. He sums up the therapeutic indications as follows: Every malignant or suspected tumor is given a single powerful roentgen irradiation. Should the tumor be roentgen sensitive so that within six weeks after the initial exposure it is reduced to one half its original size, the irradiation is repeated until no further reduction takes place. The use of radium is then resorted to. The tumors that do not respond to the initial irradiation are at once subject to a radical extirpation, which is however followed by repeated irradiations to prevent recurrence. A recent recurrence is best treated by intensive roentgen irradiation, after which it may be possible to do a partial resection of the growth and to implant radium. The likely paralysis of the facial nerve does not constitute a contraindication to therapy, since its involvement by the malignant tumor sooner or later is a foregone conclusion. The radical therapy in such cases is further indicated by the unbearable pain. Distant metastases can be retarded only by irradiation. A recent benign parotid tumor is best treated by irradiation. A progressive, even though slow enlargement, demands operative intervention even at the risk of facial palsy. Because of frequent recurrence and tendency to malignant degeneration, every case of a benign parotid tumor is to be suspected, after the surgical removal, to prophylactic irradiation.—*J.A.M.A.*, Dec. 22, 1934.

Changes in the Mouth During Menstruation (A. Klein, Zhnarztl. Rundsch., 1934, No. 43, pp. 1489-1494, 1522-1531): The author studied eighty cases during and after the period of menstruation. In twenty-seven cases, changes occurred in the mouth during the menstrual period. In twenty cases, inflammatory processes of the mucous membrane of the mouth were observed. In some, there was hyperemia

of the gums, with reddening, swelling and burning pain; in others, gingivitis or stomatitis (aphthous) and herpes labialis. In one case, swelling of the salivary glands recurred every four to eight weeks. In twelve cases, changes in tooth structure and periodontium were observed, as looseness of teeth, menstrual periodontitis and drawing pain in sound teeth. In six cases, this pain was extended to the angle of the ears and to the cranium. Vicarious bleeding was not observed. The influence of menstruation on caries was observed only in the nonparous. Of thirty-seven patients with a menstrual flow occurring every two, three or four weeks, the author could not find any difference in caries frequency as Niesel describes it in literature. In most cases, the frequency was the same. All these findings, the author asserts, were purely influenced by menstruation and not the presence of calculus, teeth irregularities or infectious processes. Gynecologic influences may be a cause. They were absent during and after menstruation in the cases studied.

OSCAR KARPF.

Experimental Research on Focal Infection Especially on the Power of Elective Localization of Streptococci (B. Mela, Deutsche Zahn-Mund-Kiefer Heilk., 1934, pp. 65-79): The author studied the problem of elective localization of fifty-two varieties of streptococci cultures. Thirty-seven cultures were obtained from the mouths of persons some of whom were healthy and some suffering from nephritis and chronic arthritis. Fifteen cultures were isolated from gastric and intestinal ulcers that were surgically removed. Using Rosenow's technic, the author always found a general infection of the experimental animal. Bacteriologic and histologic studies showed the presence of streptococci in all structures. The author acknowledges that, in most cases, these bacteria show a predilection for certain structures (joints) and affect mostly these structures. Streptococci obtained from the mouths of nephritics and arthritics localized mostly in the kidneys and joints respectively, and had a destructive effect on these structures.

OSCAR KARPF.

MISCELLANY

BOOK REVIEWS

Useful Drugs. A list of drugs selected to supply the demand for a less extensive materia medica with a brief discussion of their actions, uses and dosage. Prepared under the direction and supervision of the Council on Pharmacy and Chemistry of the American Medical Association. Edited by Robert A. Hatcher, Ph.M., Sc.D., M.D., and Cary Eggleston, M.D. Ed. 9. 195 pages. Price, 60 cents. Published by the American Medical Association, Chicago.

"Useful Drugs" is one of the many publications of the Council on Pharmacy and Chemistry of the American Medical Association. It contains a list of drugs selected to supply the demand for a less extensive materia medica, with a brief discussion of their actions, uses and dosage. "Useful Drugs" is now in its ninth edition, a testimony to the secure place which it has found in the teaching and practice of medicine. Most teachers of pharmacology use it as a collateral textbook in their teaching of the subject. In the preface to the sixth edition of his "Text-Book of Pharmacology and Therapeutics," Cushny says:

"For as long as he (the medical student) has to learn the supposed virtues of a host of obscure substances, he will tend to use them in practice, even if only tentatively. This in turn necessitates their inclusion in the pharmacopeias, which again gives them

some standing and perpetuates them as subjects of teaching and examination. If examiners would break this vicious circle they would render the subject of pharmacology more attractive to him. There is no question that the insistence on numberless preparations of drugs of questionable value has discouraged interest in therapeutics."

In addition to short monographs on the pharmacy and chemistry, physiology and pharmacology and therapeutic uses of useful drugs, there are a number of appendices giving useful information. One of the most useful of these appendices is the therapeutic index, wherein drugs are arranged under eleven large groups of therapeutic interest. "Useful Drugs" is no less interesting to the dentist. It is not an easy matter to distinguish the dividing line between the use of a drug in the general practice of medicine and some of the circumstances met with in the general practice of dentistry. Hence, "Useful Drugs" should have an appeal to the dentist. It is of further interest to the dentist because much of the material contained therein has been used in the compilation of "Accepted Dental Remedies," published by the Council on Dental Therapeutics, which is now in its fourth printing. The price of "Useful Drugs," 60 cents, is so low that no dentist will want to be without it. It and "Accepted Dental Remedies" give the dentist the most up-to-date information on the really useful drugs of dentistry. An application of the material contained therein should go a long way to free the dentist from certain of the undesirable situations in which he now finds himself in the matter of the new proprietaries, which, in many cases, turn out to be nostrums.

SAMUEL M. GORDON.

Mouth Infection, Clinical Histories. By Oliver T. Osborne, professor of therapeutics, emeritus and formerly clinical professor of medicine, Yale University.

In the preface, the author tells the history of his interest in mouth infection. His first paper on the subject was read in 1917. He began careful observations one year earlier. As a pioneer, he was ridiculed and frowned on by physicians and dentists. He asserted that the greatest menace to the civilized world was mouth infection and, at the present time, he sees no reason to change his belief or modify his assertion. In the clinical story, the first chapter, he lists a number of diseases, possible sequelae of mouth infections, also glandular affections. He notes that both physicians and dentists, many of each, are still very careless about mouth infection, but the layman has been educated to the point where he demands the removal of the infection menace, roentgenograms and tests when the doctors have neglected such procedures. He emphasizes the fact that it is impossible to determine the exact date when a pulpless tooth becomes a source of danger; that it should be stressed that one pulpless tooth can cause the most serious trouble, and therefore the question is not one of how much infection, but is there any. The book is almost entirely a private journal of case histories. There is a short chapter on Vincent's infection, three pages on the tongue, one on adenoids, one-half page on growths, two on the toothbrush, one and one-half pages of bibliography and two of index, making a total of 119 pages. The preface and clinical story are intensely personal, the tone of it that of a writer whose mind is made up and the answer given beyond dispute. Every observing physician and every dentist could collate similar stories from his practice. The tone of the book and the expression of it leave nothing but extraction for a pulpless tooth despite many facts that all dentists and most physicians know. Teeth, though pulpless, if not infected are of service. Research to save them and preserve them uninfected would not go on if extraction were immediate on the loss of pulps. Service and the possibility of research will justify research. This little book is final. It presents a challenge nonetheless to both physician and dentist. The author, address 1155 Forest Road, New Haven, Conn., sells the book for $2.

T.

Anatomy for Dental Students. By E. P.

Stibbe. Published by William Wood & Company, Baltimore, 1934. Price, $6.00.

The text is designated as systemic and practical and was compiled by W. Wright, professor of anatomy, London Hospital Medical College; T. Yeates, professor of anatomy, Middlesex Hospital Medical School; J. S. B. Stopford, professor of anatomy in the University of Manchester; S. E. Whitnall, professor of anatomy in the University of Bristol, and Mary F. L. Keene, professor of anatomy in the London School of Medicine for Women. E. P. Stibbe is senior demonstrator in anatomy in the London Hospital Medical College and examiner in anatomy to the Royal College of Surgeons. The preface advises that the book is intended to present to dental students and practitioners as much of the subject of human anatomy as is necessary for licentiate examinations and for reference after qualifying. It proposes to save the student the toil and the possible mistake of selecting material for qualifying from the more comprehensive anatomies. It claims to meet the need of many provincial American and colonial examining bodies. Systemic anatomy has 188 pages devoted to it; the remainder, 211 pages, being a laboratory dissecting manual. When the space used by cuts is subtracted, the amount of reading material becomes apparent, and the text is well illustrated. The book meets the purpose for which it is designed, is made of good paper and is excellently bound.

T.

Law for the Dentist. By Leslie Childs. Published by the Dental Cosmos, Philadelphia.

The gist of the book appeared serially in the *Dental Cosmos* during the past year. It contains 324 pages, covering very fully the legal exigencies that may arise in a dentist's day. It is illustrated with 101 cases in sixty-three chapters. It is well indexed and of convenient size—a serviceable and instructive book, as well as a much needed one. "Law for the Dentist" is not for sale, but is a subscription premium.

T.

INVESTIGATION OF "CHIEF" WHITE GOLD "CASTLOY"

Aug. 27, 1934, the Research Commission received a communication stating that an alloy having the trade brand name "Chief Castloy" was being advertised and represented as a white gold alloy. Test data which accompanied this communication tended to show that the alloy did not con-

"CHIEF" 5 - DWT.
WHITE GOLD
"CASTLOY"
— FOR —
INLAYS - 3/4 CROWNS - 1 PIECE BRIDGES
Mfg. by PONTIAC REFINING CO.
INC
PONTIAC, MICHIGAN
Todays Economy Gold

"Chief Castloy"
WHITE GOLD

Present Gold Prices demand that we again manufacture our old successful formula "CASTLOY"

Created for Inlays, Cast Crowns, 1 piece Bridges.

Scientifically produced. Highly indorsed by Dentists and Dental Laboratories for its fine working qualities. It casts easily, fuses readily, takes exceedingly tough, sharp margins, burnishes well, retains its color under all ordinary mouth conditions, and no special technique is required as it is very similar to an Inlay gold in its fusing point and cooling shrinkage.

Perferred by many patients for its beauty; it being less conspicuous than yellow gold, and also its economy.

Per dwt. . . . $ .70
Per oz. 13.00

— Mfg. by —
Pontiac Refining Company
INC
E. Lawrence St. at Perry
Pontiac, Michigan
Sole Mfrs. "Chief" Dental Products

Advertisement of Castloy

tain gold in appreciable quantities. Therefore, the Research Commission purchased directly from the Pontiac Refining Company, of Pontiac, Mich., 15 dwt. of "Chief Castloy." Purchases of 5 dwt. each were made on Sept. 6, Nov. 5 and Nov. 9, 1934. Facsimiles of the original package and of the claims and the directions for use which accompanied the package are shown in the accompanying illustration.

All three samples were analyzed for gold. The sample purchased on September 6 was found to contain approximately 0.04 per cent of gold. This is equivalent to one part of gold in 2,500 parts of alloy. Neither platinum nor palladium were detected. The two samples purchased on November 5 and 9 were found to contain approximately 0.005 per cent of gold, this being equivalent to one part of gold in 20,000 of alloy.

On the basis of the United States Treasury price of $1.75 a hundredweight, the intrinsic value of gold present in 1 dwt. of "Chief Castloy" containing 0.04 per cent of gold would be $0.0007. To state this in another way: It would be necessary to buy approximately 14.3 dwt. of "Chief Castloy," an amount which would cost over $10, in order to receive 1 cent's worth of gold. The value of the gold contained in the two other samples was proportionately less. As indicated above, the alloy contained neither platinum nor palladium. The purchase price of the alloy was 70 cents a hundredweight.

The Research Commission is of the opinion that the dentist would run a much smaller risk of obtaining unsatisfactory materials in the purchase of inlay casting golds if he bought only those gold alloys that are certified to the Research Commission as complying with the A.D.A. Specification. The November issue of THE JOURNAL (page 2028) contains the list of alloys which have been so certified up to the present time.

The Research Commission of the American Dental Association desires to protect the dentist in purchasing dental materials. At the present time, the Commission's limited resources and personnel do not permit systematic investigation of the advertising of dental materials. The Commission is able to investigate seemingly fraudulent claims only when the complaint is accompanied by supporting test data or other strong evidence that the claim is actually fraudulent.

The findings of the investigation have been presented to the Federal Trade Commission for their consideration.*

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*Manufactured by the Pontiac Refining Company, Pontiac, Mich.

*Publication recommended by members of the Executive Board of the Research Commission.

*Report submitted to the Research Commission of the American Dental Association by the American Dental Asociation Fellowship at the National Bureau of Standards.

NEWS

CALIFORNIA

Medical Economics Survey: The medical economics survey approved by the house of delegates of the California Medical Association at its last annual meeting has been started. One, on the health and economic status of the general public, is to be conducted by field workers. About 1 per cent of the families in twenty-five counties will be reached, it is expected. The other aspect of the study involves an analysis of the medical and dental professions and of the hospital and public health facilities of California, to be made from the data obtained from questionnaires that have been mailed to every physician, dentist, hospital and clinic in the state. The field work has already been completed in two counties. Paul A. Dodd, Ph.D., assistant professor of economics, University of California, Los Angeles, is director of the survey.

Dr. Robinson Endorsed for Reappointment: Wilfred H. Robinson, whose term on the state board of dental examiners, expired in January, was unanimously endorsed by the state society for reappointment. A letter to this effect was sent to Gov. Frank Merriam.

COLORADO

Death of Dr. Norman: John M. Norman, for sixty years a practitioner of dentistry in Denver, died December 4; aged 85. Dr. Norman was a drummer boy in the Civil War, on the Confederate side, serving until Lee's surrender. After the war, he worked his way through a small college in Tennessee, and then enrolled in the Baltimore Medical College, from which he graduated in 1871. He practiced two years in Trenton, Tenn., before locating in Denver. He continued in practice until three weeks before his death, and was very active in his profession, an excellent operator and a forceful speaker. He was president of the first board of dental examiners in Colorado and at one time president of the state society. Dr. Norman was instrumental in organizing the Denver Dental College, of which he was dean in 1888. A son and a daughter survive.

ILLINOIS

Grant Made to University of Chicago: A grant has been made to the University of Chicago by Nathan Dauby, Cleveland, and Morton J. May, St. Louis, trustees of the Beaumont Foundation of Cleveland, for the purpose of supporting the researches of J. M. Rogoff, formerly associate professor of experimental medicine at Western Reserve University, on the suprarenal and other ductless glands. Dr. Rogoff is now working in the department of physiology at the University of Chicago.

IOWA

Iowa State Dental Society Reaches High Mark in Membership: Dec. 1, 1934, the membership of the society stood at 1,121, an all-time high mark. This is an increase of 239 members, 111 of whom are new members, while 128 are reinstated members. In 1933, the total membership was 882.

MASSACHUSETTS

Dr. Edsall Retires as Dean of Harvard: Davis Linn Edsall will retire as dean of the faculty of medicine and dentistry of the medical school and the school of public health of Harvard University, Sept. 1, 1935, and become dean emeritus. In 1912, he was appointed Jackson professor of clinical medicine at Harvard, becoming dean of the medical school and of the faculty of medicine in 1918. He has been dean of the school of public health since 1922 and of the faculty of dentistry since 1924.

Dental Conference at Yale University: A group of fifty dental surgeons from vari-

ous parts of the country met at the Yale University School of Medicine, October 24-25, for a discussion of scientific subjects relating to dentistry. A. Leroy Johnson, of New York City, presented a paper on studies of the teeth and jaws of dogs from the Cornell Experimental Morphology Farm. A clinical study of restorative work on the teeth from the point of view of the effect on the health of the individual in subsequent years was described by Yngve Hildebrand, of the Royal Institute of Stockholm, Sweden. A report on a study at Yale on nutrition and dental changes was presented by Prof. Arthur H. Smith, Miss Aline U. Orten, Casper C. Burn and Sumter S. Arnim. The purposes of the dental program at Yale were described as: (1) to place the study of the natural history of the teeth in health and disease on a sound scientific basis; (2) to investigate the causes of diseases of the teeth and associated structures in relation both to specific agents of local morbidity and to the general health of the individual; (3) to create a liaison between dental and medical personnel by developing a group of men for the interpretation of diseases of the teeth and their relationship to the functioning of the human organism as a whole.

NEW YORK

Drs. Whipple, Minot and Murphy Honored by King Gustav: George H. Whipple, of the School of Medicine and Dentistry of the University of Rochester, and George R. Minot and Dr. William P. Murphy, of the Harvard University Medical School, joint recipients of the Nobel prize in physiology and medicine, were present at ceremonies held in Stockholm, December 10, on the occasion of the presentation to them by King Gustav of the diplomas, gold medals and money awards connected with the prize award.

Dr. Seldin Honored: Harry M. Seldin, who recently won the International Anesthesia Research Society's silver trophy shield, was the guest of honor, November 7, at a dinner given in New York City by friends and colleagues.

Testimonial to John T. Hanks: March 4 at the New York Academy of Medicine Building, New York City, the First District Dental Society will honor John T. Hanks, retiring secretary of the society, with a dinner.

PENNSYLVANIA

Dr. Fischelis Dies: Dr. Philipp Fischelis died at his home in Philadelphia of angina pectoris on Tuesday, October 30, at the age of 76. He was buried the following Friday at Chelten Hills Cemetery in Philadelphia. Although not in the best of health for some months he had continued his teaching in the School of Dentistry of Temple University and had lectured to his classes on the afternoon preceding his demise. He returned to his home from a faculty meeting late on Monday, October 29, and passed away shortly after midnight. Dr. Fischelis was born on December 8, 1857. He studied biology and medicine at various universities in Europe, including Leipsig, Koenigsberg and Berlin. He received the degree of doctor of medicine from the University of Berlin in 1885 and after further study and internship at hospitals in Berlin. He came to the United States in 1889, settling in Philadelphia, where he practiced medicine for many years and taught histology, embryology and pathology at several medical and dental colleges. In 1890 he married Ernestine Kempt, who died in 1923. They had three sons and three daughters, all of whom survive. Among the teaching positions held by Dr. Fischelis are the following: instructor in rhinology and laryngology at the Philadelphia Polyclinic (1893-1902); demonstrator of histology and embryology, Medico-Chirurgical College of Philadelphia (1903-1909); associate professor (1909-1917); professor of histology, embryology and general pathology and director of laboratories in the Dental School of Temple University, Philadelphia (1917-1934). His researches in Germany and in this country included work on the development of the thyroid and thymus glands and lungs. He was author of the chapters on reproduction and evolution in "Ott's Physiology" and co-author with Dr. I. N.

Broomell of "Anatomy and Histology of the Mouth and Teeth." He was a member of a number of outstanding scientific organizations.—*Science,* Dec. 7, 1934.

Presentation of Dental Library: The administrators of the will of the late L. Ashley Faught, D.D.S., presented his dental library of more than 1,000 volumes to the Philadelphia County Medical Society at a meeting, November 21, in the auditorium of the society. Dr. Faught's son, Mr. Albert Smith Faught, made the presentation. Seth A. Brumm, president of the society, accepted the gift for the society and James M. Anders for the library committee. After the ceremony, members inspected the library. Dr. Faught, who died about a year ago, was professor of operative dentistry at Temple University for many years. He was the father of Dr. Francis Ashley Faught.

Faculty Changes: There have been several additions to the various departments of the Faculty of the Evans Institute. Jay H. Ginns has been appointed instructor in operative dentistry. J. M. Zook has been appointed assistant to Dr. Cragin in the root canal section. In the department of dental histopathology, Edward E. Steeves has been appointed laboratory assistant in odontography, and lecturer on odontography to the dental hygienists. Dr. Schlack has received a research fellowship and will continue his work in dental pathology and dental histology as well as carry on his research work.

WISCONSIN

Membership Increase: From a low mark in 1932, the paid membership of the Wisconsin State Dental Society has, the past year, made a remarkable comeback. The secretary reported to the executive council, December 1, that 1,055 members have paid their dues for 1934. The goal set for 1935 is no less than 1,500 members.

FOREIGN

PARIS

Social Insurance Law Unpopular: There is much discontent in French medical circles and an active discussion is taking place as to what can be done to bring the medical profession into line with the rapid changes taking place in organized society, especially since the World War. Clinics, controlled and directed by groups of physicians, as they exist in the United States, are practically nonexistent not only in France but also all over Europe. A series of letters in a recent issue of one of the Paris journals reveals the opposition of those who hesitate to abandon the traditions of medicine and the fervent plea of the more progressive physicians to adapt themselves to the social evolution and establish diagnostic centers under private control. The French social insurance law is not very popular, either with those whom it protects against illness and old age or with the medical profession. It differs, however, from similar legislation in Germany in permitting the assured to choose his own physician, who must adjust his charges to a fixed government tariff. The establishment of diagnostic centers all over France by the profession is one solution of the question before the government steps in to organize this method of extending the benefits of modern medicine.—Foreign Letters, *J.A.M.A.,* Dec. 15, 1934.

CANADA

Dr. Webster Resigns: In the December *Dominion Dental Journal* appears an editorial under the title "We Lay Down the Pen and the Pencil." In it, Dr. Webster voices his farewell, gives a brief history of the periodical and expresses his thanks to his co-workers. He writes: "The *Journal* was established under its present name over forty years ago by the Nesbit Publishing Company with the financial background of C. H. Hubbard Company. When this company failed, publication was taken over by some of its friends and was continued until 1911, when the Consolidated Press, the present owners, took it over with the editor and the staff. It is now fitting and expedient in the interest of dentistry that the name be changed to the *Journal of the Canadian Dental Association* with a new set of officers under the editorship of M. H. Garvin, Winnipeg,

and under the ownership and control of the Canadian Dental Association. Under the new arrangement, the *Journal* will be issued from Toronto on the tenth of each month. As we lay down the sceptre of office, we expect it to be taken up with all the vigor and intelligence of young and aggressive Canadians. We hope that those things which the *Dominion Dental Journal* espoused and which were right will be prosecuted until attained."

BERLIN

Number of Toothbrushes Among Students: The public health office of the German Hygiene Institute of Dresden recently made an extensive inquiry in German schools as to how many students possess toothbrushes. The results are as surprising as deplorable. Of 7,000 schools with 900,000 students, 42.4 per cent owned their own toothbrushes, 18.2 per cent have a family toothbrush and 39.4 per cent had none. To this must be added that close to 5,000,000 school children at least do not use their own toothbrushes.—*J.A.M.A.*, Dec. 22, 1934.

GENERAL

Death of Kaethe Weller Dewey: Kaethe W. Dewey, M.D., died in Bad-Nauheim, Germany, Nov. 11, 1934. She was a graduate of Rush Medical College, class of 1912. She became assistant in obstetrics and gynecology and fellow in pathology at her alma mater, and in 1915, was appointed research assistant professor of oral pathology at the University of Illinois, College of Dentistry. In 1927, she went to the University of Pittsburgh as associate professor of clincal pathology in the dental school. She was an associate editor of the *Journal of Dental Research*. Dr. Dewey was an indefatigable and careful worker. Although her papers were numerous, appearing in medical and dental journals, her best known work was the demonstration of lymphatics in the dental pulp and pericementum which appeared in the *Dental Cosmos* in 1917. She also published a textbook, "Pathology of the Mouth," in 1925 (with Frederick B. Moorehead).

A CORRECTION

Through an error in initials, the death of Milton J. Waas was reported in the January JOURNAL. Dr. Waas, who is in good health, is in practice in Philadelphia. The death of his father, J. A. Waas, occurred December 6.

DEATHS

Carter, George H., Milwaukee, Wis.; Marquette University School of Dentistry, 1901; died October 19; aged 66.

Darling, Loren M., Des Moines, Iowa; Northwestern University Dental School, 1892; died November 20.

Herthel, Stephen W., Milwaukee, Wis.; Marquette University School of Dentistry, 1914; died November 21; aged 42.

Hooker, Charles, Brooklyn, N. Y.; New York University College of Dentistry, 1904; died December 7; aged 51.

Ladner, E. J., Appleton, Wis.; Marquette University School of Dentistry, 1925; died recently; aged 35.

Lockhart, Will T., Seattle, Wash.; State University of Iowa College of Dentistry, 1900; died September 10.

Peters, Jacob, Glenvil, Nebr.; University of Nebraska College of Dentistry, 1923; died October 17, on his thirty-fourth birthday.

Reed, William A., Marengo, Iowa; Chicago College of Dental Surgery, 1891; died November 27.

Stephen, Louis J., Milwaukee, Wis.; Thomas W. Evans Institute and Museum of Dentistry, 1891; died November 20; aged 71.

Waas, J. A., Hammonton, N. J.; Pennsylvania Dental College, 1883; died December 6; aged 74. Dr. Waas practiced in Hammonton for over fifty-one years. He was a charter member of the Southern Dental Society of New Jersey. Surviving are the widow and two sons of his first marriage: Milton J. Waas, Philadelphia, and Clifford J. Waas, New York City, both dentists.

ANNOUNCEMENTS*

CALENDAR OF MEETINGS

American Dental Association, New Orleans, La., November 4-8.

American Association of Dental Schools, Chicago, March 18-20.

American Dental Society of Europe, London, July 31-August 3.

American Society of Orthodontists, New York City, April 30-May 3.

Belgian National Dental Congress, Brussels, August.

Dallas (Texas) Midwinter Dental Clinic, February 4-6.

Five State Postgraduate Clinic, Washington, D. C., March 18-20.

Thomas P. Hinman Midwinter Clinic, Atlanta, March 18-19.

International Dental Congress, Vienna, Aug. 2-9, 1936.

Kansas City-Western Clinic Association, Kansas City, Mo., March 7-8.

Midwinter Clinic of the Chicago Dental Society, February 18-21.

National Board of Dental Examiners, January 11-12; May 24-25.

New York State Dental Hygienists Association, Saranac, June 12-15.

North Atlantic Orthodontic Society, Brooklyn, N. Y., February 27.

University of Buffalo School of Dentistry Alumni Association, Buffalo, March 6-8.

American Dental Assistants Association, New Orleans, November 4-8.

Society for the Advancement of General Anesthesia in Dentistry, New York City, third Monday in February, April, October and December.

District of Columbia at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

STATE SOCIETIES

February

Minnesota, at Minneapolis (26-28)

April

Alabama, at Birmingham (16-18)
California, at Oakland (8-10)
Kentucky, at Paducah (1-3)
Massachusetts, at Boston (29-May 2)
Michigan, at Detroit (22-24)
Mississippi, at Jackson (22-24)
New Jersey, at Atlantic City (24-25)
Texas, at Waco (15-18)
Wisconsin, at Milwaukee (16-18)

May

Arkansas, at Little Rock (13-15)
Connecticut, at Waterbury (8-10)
Georgia, at Atlanta (13-15)
Illinois, at Quincy (14-16)
Indiana, at Indianapolis (20-22)
Iowa, at Des Moines (7-9)
Maryland, at Baltimore (6-8)
Montana, at Lewiston (9-11)
Nebraska, at Omaha (20-23)
Pennsylvania, at Altoona (7-9)
South Dakota, at Huron (13-14)
Tennessee, at Nashville (14-16)
Vermont, at Burlington (15-17)
West Virginia, at Parkersburg (20-22)

June

Maine, at Augusta (21-22)
New Hampshire, at Rye Beach (26-27)
New York, at Upper Saranac Lake (12-15)
North Carolina, at Blowing Rock (17-19)
Oregon, at Portland (5-8)

July

Southern California, at Long Beach (8-12)
Virginia, at Hot Springs (1-3)

November

Louisiana, at New Orleans (4-8)

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

STATE BOARD OF DENTAL EXAMINERS

Indiana, at Indianapolis, June 18-21. J. M. Hale, Mt. Vernon, Secretary.

Iowa, at Des Moines, May 27-30. Hardy F. Pool, Mason City, Secretary.

New Jersey, at Trenton, June 24-29. J. C. Forsyth, 148 W. State St., Trenton, Secretary.

INDIANA STATE DENTAL ASSOCIATION

The seventy-seventh annual meeting of the Indiana State Dental Association will be held at the Claypool Hotel, Indianapolis, May 20-22.

ALBERT R. ROSS, *Secretary,*
Murdock Bldg.,
Lafayette.

PENNSYLVANIA STATE DENTAL SOCIETY

The Pennsylvania State Dental Society will meet in Altoona, May 7-9.

LARUE W. BRAUCHER,
Central Trust Bldg.,
Altoona.

INDIANA STATE BOARD OF DENTAL EXAMINERS

The Indiana State Board of Dental Examiners will hold its next meeting for the purpose of conducting examinations for licensure to practice dentistry in Indiana in Indianapolis, June 18-21. Applications properly executed and accompanied by proper credentials and examination fee of $25 should be in the hands of the secretary ten days prior to the date of examination. For applications, instructions to candidates and any further information, address

J. M. HALE, *Secretary,*
Mt. Vernon.

IOWA STATE BOARD OF DENTAL EXAMINERS

The next examination of the Iowa State Board of Dental Examiners will be held at Iowa City, at the College of Dentistry, University of Iowa, May 27-30. Applications properly executed, together with college diploma and fee of $25 must be filed wtih the State Department of Health, Des Moines, at least fifteen days prior to the first day of the examination.

HARDY F. POOL, *Secretary,*
Mason City.

THOMAS P. HINMAN MIDWINTER CLINIC

The Thomas P. Hinman Midwinter Clinic will hold its annual meeting March 18-19, at the Biltmore Hotel, Atlanta.

JOSEPH D. OSBORNE, *Secretary,*
Atlanta.

NORTH ATLANTIC ORTHODONTIC SOCIETY

The North Atlantic Orthodontic Society extends to the general practitioner an invitation to be present at the scientific meeting, February 28, at 8 p. m., in the Knights of Columbus Bldg., 1 Prospect Park West, Brooklyn, N. Y.

TALBOT H. LEBLANC, *Secretary,*
515 Ocean Ave.
Brooklyn, N. Y.

AMERICAN ASSOCIATION OF DENTAL SCHOOLS

The next meeting of the American Association of Dental Schools will be held at the Stevens Hotel in Chicago, March 18-20.

G. D. TIMMONS, *Secretary,*
Indiana University,
School of Dentistry,
Indianapolis, Ind.

NINTH DALLAS MIDWINTER DENTAL CLINIC

The ninth Dallas Midwinter Dental Clinic will be held at Baylor Dental College, February 4-6. George B. Winter, St. Louis, will conduct clinics on general exodontia; Ralph C. Cooley, Houston, Texas, on restorative dentistry; Charles A. Sweet, Oakland, Calif., on children's dentistry, and R. O. Schlosser, Chicago, on fundamental phases of complete denture prosthesis. For further information, address

JOHN R. SWANSON, *Secretary,*
923 Medical Arts Bldg.,
Dallas, Texas.

UNIVERSITY OF BUFFALO SCHOOL OF DENTISTRY ALUMNI ASSOCIATION

The thirty-fifth annual meeting of the University of Buffalo School of Dentistry Alumni Association will be held in Buffalo at the Hotel Statler, March 6-8, with three full days of papers, clinics and entertainment.

E. F. MIMMACK, *Chairman,*
Committee on Publicity.

KANSAS CITY-WESTERN DENTAL CLINIC ASSOCIATION

The Kansas City-Western Clinic Association will meet March 7-8.

R. W. EDWARDS, *Secretary.*

THE AMERICAN BOARD OF ORTHODONTIA*

A meeting of the American Board of Orthodontia will be held at the Waldorf-Astoria Hotel, New York City, April 29. Those orthodontists who desire to qualify for a certificate from the board should secure the necessary application from the secretary. The application must be returned to the secretary, together with any other required credentials, at least sixty days prior to the date of examination. In order to expedite the examinations, the secretary will designate the hour at which the applicant may appear before the board. Applications filed at the time of the board meeting will have preliminary consideration, so that the applicant may be advised of the work required for his subsequent examination. Attention is called to the following resolutions adopted by the Board:

Any person desiring to make application to the board for a certificate shall have been in the exclusive practice of orthodontia for a period of not less than five years or an equivalent to be determined by the board and based upon the following conditions:

1. He must be an instructor in orthodontia in a school satisfactory to the board.
2. He must be an associate in the office of an orthodontist whose standing is satisfactory to the board.

It is to be definitely understood that any person at the time of making application for a certificate shall be in the exclusive practice of orthodontia in his own name.

A luncheon or dinner meeting of those orthodontists who have received the certificate of the American Board of Orthodontia will be held some time during the meeting of the American Society of Orthodontists. Members will be notified of the time and place.

OREN A. OLIVER, *Secretary,*
Medical Arts Bldg.,
Nashville, Tenn.

*Created by the American Society of Orthodontists, 1929; incorporated, January, 1930, State of Illinois, U. S. A.

ORTHODONTIA FOR THE GENERAL PRACTITIONER

A postgraduate course in orthodontia for the general practitioner will be held in the Faculty of Dentistry, University of Toronto, for two weeks, February 18-March 2. The object of this course is to give the general practitioner of dentistry who is interested in the subject of orthodontia a short intensive course which will improve his ability to make a diagnosis, enable him to select cases in which he would be justified in undertaking treatment, prepare him to make the necessary appliances and give the patient satisfactory treatment. This course is not intended to train a practitioner for specialization but rather to enable him to render better service to patients who are desirous of having the family dentist furnish some degree of orthodontic treatment. This course will be under the direction of Charles A. Corrigan, D.D.S., C. Angus Kennedy, D.D.S., and S. Stuart Crouch, D.D.S. A few lectures will also be given by faculty members on correlated subjects. The class will be limited to about ten practitioners. On acceptance, candidates will receive a list of instruments, materials and books required.

Correspondence should be addressed to:

WALLACE SECCOMBE, *Dean,*
Faculty of Dentistry,
230 College Street,
Toronto, Ontario.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

The eleventh annual meeting of the American Dental Assistants Association will be held in New Orleans, La., November 4-8. For further information, address

LUCILE S. HODGE, *General Secretary,*
401 Medical Arts Bldg.,
Knoxville, Tenn.

MICHIGAN STATE DENTAL ASSOCIATION—CORRECTION OF DATES

The Michigan State Dental Association will meet April 22-24, instead of 15-17 as listed in the Directory of State Society Officers and Dates of Meetings, 1935.

FEDERATION OF THE DENTAL SURGEONS OF AUSTRIA

In celebration of the fifteenth anniversary of its foundation, the Federation of Dental Surgeons of Austria has decided to offer three prizes of the total value of 1,000 shillings (Austrian) for the three best articles on practical dentistry not previously published, to be divided into: first prize, 500 shillings; second prize, 300 shillings, and third prize, 200 shillings. The conditions are as follows:

1. Only such articles as reach the Federation by May 31, 1935, shall be acceptable.

2. The articles shall deal only with practical dentistry and be clear enough to serve the practitioner as a complete guide in applying the idea.

3. Articles may not be withdrawn and must be left at the disposal of the editor of the official organ of the Federation, the *Zeitschrift für Stomatologie.* The contributions must be typewritten on one side only of the paper and two copies must be submitted.

4. Articles should not bear the name of the author, but a symbol, the author's name and address to be in a sealed envelope bearing the same symbol on the outside.

Address: Verband der Zahnarztlichen Vereine Oesterreichs, Wein I, Hoher Markt 4.

EMIL STEINSCHNEIDER.

IDENTIFICATION SOUGHT

About the middle of October, 1934, the skeleton of a man was found near Bald Mountain in the northern part of Herkimer County, New York State. It is very evident that it had lain there for several months. To date, it has been impossible to establish its identity and it was

thought that perhaps through the medium of THE JOURNAL, identification might be made from the fillings in the teeth. Herewith are photographs of both jaws. Anything that can be done in an effort to establish the identification of this skeleton will be very much appreciated.

STEPHEN MCGRATH, *Captain, Commanding*
New York State Troopers,
Executive Dept., Division of State Police,
Oneida, N. Y.

1935 1935

New Orleans

Are you satisfied with your practice?

Do your dental operations satisfy you and your patients?

Dissatisfaction sometimes leads to increased effort

How are collections?

Maybe you might be able to make them better by discussing the matter with your fellow members at New Orleans November 4-8, 1935

An A.D.A. Meeting is equivalent to a real postgraduate course of demonstration and study

Start now to prepare for this great meeting so you will not be disappointed when

November 4, 1935 arrives

IT MIGHT BE WELL TO MAKE YOUR HOTEL RESERVATIONS NOW

LIBRARY BUREAU

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